

Identification of Ergonomic Risk on Workers Using Quick Exposure Check and Rapid Upper Limb Assessment Methods

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ABSTRACT

Pulau Tiga Palm Oil Mill (PKS) is one of the business units of PT. Nusantara I Plantation located in Pulau Tiga Village, Tamiang Hulu District, Aceh Tamiang Regency, is engaged in palm oil processing. Some workstations at PKS Pulau Tiga still use a manual work system, then the factor of long working hours, which is 12 hours of work/day, can make it easier for workers to experience fatigue and result in musculoskeletal complaints for workers. The purpose of this study is to identify which workstations are most at risk and which workstation facilities must be improved. The methods used in this study are the QEC, NBM, and RULA Methods.

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I. Introduction

Increased productivity is the desire of every company. Increasing the productivity of a company cannot be separated from the good performance given by the workers in the company. There are several kinds of factors that can affect the performance of workers, one of which is the physical ability of the worker. With good physical ability (not easily tired), the worker will be maximal in carrying out his work. However, if the physical ability of the worker is not good (tired easily), it can cause complaints and health problems which can result in poor performance for the worker later. These poor physical abilities are commonly referred to as Work-related Musculoskeletal Disorders (WMSDs) and must be avoided so that the performance of workers can run well.

PTPN-I is a company engaged in palm oil processing with its head office in the city of Langsa, Aceh. PTPN-I has 6 units of oil palm plantations and 3 units of Palm Oil Mills (PKS) spread across the province of Aceh. The 6 garden units are Cot Girek gardens, North Julok Rayeuk gardens, Tualang Sawit gardens, Baru gardens, Lama gardens and Pulau Tiga gardens. There are 3 units of palm oil mills, namely PKS Cot Girek, PKS Tanjung Seumantoh, and PKS Pulau Tiga. This study was carried out in the Pulau Tiga palm oil mill unit.

Pulau Tiga Palm Oil Mill (PKS) is one of the business units of PT. Nusantara Plantation – I which is located in Pulau Tiga Village, Tamiang Hulu District, Aceh Tamiang Regency. PKS Pulau Tiga is engaged in the business of processing palm oil which produces palm oil (CPO) and palm kernel/Palm Kernel (PK) and was established in 1986.

The processing process at Pulau Tiga PKS consists of nine work stations, namely loading ramp stations, sterilizer stations, threshing stations, compression stations, kernel stations, clarification stations, power stations, boiler stations, and water treatment stations. Some stations still use a manual work system, this can certainly make it easier for workers to experience fatigue. Then in addition to the factor of working hours, which is 12 hours of work/day, workers experience complaints of pain in body parts as a result of the work. If left unchecked, this will have an impact on the health of workers in the future.

To help solve this problem, it is proposed to identify ergonomic risks for workers at PKS Pulau Tiga using the Quick Exposure Check (QEC) method. From this QEC method, observations will be made of all stations in Pulau Tiga PKS so that later the riskiest workstations will be obtained. Then after that, it will be continued by measuring the body posture of workers using the Rapid Upper Limb Assessment (RULA) method and with the help of Ergofellow software. After that, suggestions for improving work facilities at risky workstations will be given in accordance with the problems and results of identification that have been carried out at the workstation..

II. Methods

The research was conducted at PT. Perkebunan Nusantara – I at the Pulau Tiga Palm Oil Mill unit located in Pulau Tiga Village, Tamiang Hulu District, Aceh Tamiang Regency. The research time was carried out in its entirety from February 2022, starting with the preparation stage for the preparation of research proposals until December 2022.

The object of the research that was observed was the operator in the processing of palm oil into crude palm oil at the Tiga Island PKS.

To obtain various kinds of data needed in this study, researchers used various data collection techniques, namely:

1. Direct observation (observation)
Direct observation (observation) is to direct observations of objects directly in the field. In this study, observations were made at PT. Perkebunan Nusantara – I at Pulau Tiga PKS unit located in Pulau Tiga Village, Tamiang Hulu District, Aceh Tamiang Regency.
2. Interview (interview)
Interviews are conducting direct questions and answers with related parties, namely the operator of the processing section of each workstation at PKS Pulau Tiga. The data was taken to determine the fatigue experienced by workers while working at PKS Pulau Tiga.
3. Questionnaire Distribution
The questionnaire is a method of conducting research used to collect data from respondents. The questionnaires distributed were the Quick Exposure Check (QEC) and Nordic Body Map (NBM).
4. Documentation
Documentation is done to collect primary data by taking photos related to the research.
5. Literature Study
A literature study is studying literature in the form of concepts or theories sourced from books, journals, and articles that support the completion of this research.

Data processing consists of:

1. Quick Exposure Check (QEC)
2. Nordic Body Map (NBM)
3. Rapid Upper Limb Assessment (RULA)
4. Anthropometry.

III. Result and Discussion

Pulau Tiga PKS is one of the business units of PTPN – I, which is engaged in palm oil processing and produces two products, namely palm oil (CPO) and palm kernel (palm kernel). Pulau Tiga PKS is located in Pulau Tiga Village, Tamiang Hulu District, Aceh Tamiang Regency, with a production time of 144 hours/week. Pulau Tiga PKS has nine workstations, namely loading ramp stations, sterilizer stations, threshing stations, compression stations, kernel stations, clarification stations, power stations, boiler stations, and water treatment stations. The explanation of each workstation at PKS Pulau Tiga is as follows:

1. Loading Ramp. Station
There are three workers at the loading ramp station with the task of filling FFB in the lorry (fruit basket) and then sending it to the sterilizer station.
2. Sterilizer Station

- There are three workers at the sterilizer station with the task of controlling the steam pressure that enters the sterilizer and then controlling the process of boiling the fruit until the fruit is ready to be processed.
3. Threshing Stasiun Station
There are five workers at the threshing station with the task of pulling the boiled fruit and then sending it to the thresher machine to separate the palm fruit from the bunch.
 4. Felt Station
There are two workers at the compression station with the task of controlling the work of the screw press machine, namely the pulverizing of the fruit and squeezing the fruit so that not much oil is added to the fruit pulp.
 5. Kernel Station
There are three workers at the kernel station with the task of processing palm kernel and controlling the processing of palm kernel until the palm kernel is ready for sale.
 6. Clarification Station
There are three workers at the clarification station with the task of controlling the palm oil refining process and ensuring that palm oil complies with the quality of marketing standards.
 7. Power Station
There are two workers at the power station with the task of controlling the turbine engine, namely, to ensure the amount of electrical energy can be met at every workstation in the Pulau Tiga PKS. Then control the amount of steam pressure sent to each workstation in need.
 8. Boiler Station
There are four workers at the boiler station with the task of controlling the fuel pressure in the boiler engine so that the turbine engine can still work to meet the electrical energy at the Pulau Tiga PKS and can meet the amount of steam required by each work station at the Pulau Tiga PKS.
 9. Water Treatment Station
There is one worker at the water treatment station with the task of controlling the water purification process and ensuring that the amount of water available is met for the Pulau Tiga PKS.

The Quick Exposure Check method calculates the questionnaires distributed by observers to 1 worker at each workstation in the Pulau Tiga PKS. Based on the results of the Quick Exposure Check (QEC) calculation for workers at each workstation at PKS Pulau Tiga, it was found that the riskiest workstation was at the loading ramp workstation, with an exposure level of 104.55% with the action category. Research and changes were carried out as soon as possible.

The Nordic Body Map (NBM) method calculates a questionnaire distributed to workers at the workstation most at risk, namely the loading ramp workstation, which is obtained from the calculation of the Quick Exposure Check (QEC) method. From the results of distributing the Nordic Body Map (NBM) questionnaire, it was found that the most complaints of 3 workers at the loading ramp station were on the waist and buttocks. This could be due to the irregular position of workers having to stand and bend down with their hands down, so they feel complaints about the pain. So that these complaints become the focus of the company to take action to improve work, both work facilities and non-physical facilities, such as work methods or work rotations regularly so that complaints on the waist, buttocks, and other skeletal complaints can be minimized or even eliminated.

In the Rapid Upper Limb Assessment (RULA) method, calculations are made on the work posture of loading ramp station workers. Based on the results of the Rapid Upper Limb Assessment (RULA) calculation for three workers at the loading ramp station, it was found that one worker had a score of 7, with the "action now" action, for two workers, the score was 7, with the "action now" action. and on workers 3 level score of 7, with the action "action now".

In calculating the five dimensions of the worker's body, the results are for the data uniformity test, all data are between BKA and BKB so that the data is suitable for subsequent calculations. For the data adequacy test, the results of the calculation of 5 body dimensions measured are $N' < N$ so that the data is declared sufficient. Then for the calculation of percentiles used percentile values of 95% with the results of Standing Elbow Height of 119.69 cm, Arm Length of 30.61 cm, Finger Length of 9.28 cm, Base of Hands of 21.65 cm, and Arm Width of 8, 61 cm. This measure will be used later to design the proposed improvement of work facilities.

Based on the results of the Quick Exposure Check (QEC), Nordic Body Map (NBM), and Rapid Upper Limb Assessment (RULA) calculations, it is found that it is necessary to improve work facilities at loading ramp workstations to avoid musculoskeletal complaints against workers at loading ramp stations. As for the proposed improvement of work facilities at the loading ramp station, the author suggests the company modify the shovel used to shovel loose palm kernels at the loading ramp workstation, the modification is to redesign the shovel based on the dimensions of the worker's body at the loading ramp work station which has been obtained from the results. previous anthropometric calculations. As for the shovel size design as follows:

Table 1. Design Size of Oil Palm Loose Shovel

No.	Spade Dimension	Size(cm)
1.	Spade Length	119,69
2.	Spade Width	30,61
3.	Shovel Hold Diameter	9,28
4.	Shovel Handle Diameter	21,65
5.	Shovel Handle Width	8,61

^a. Source: Data Processing

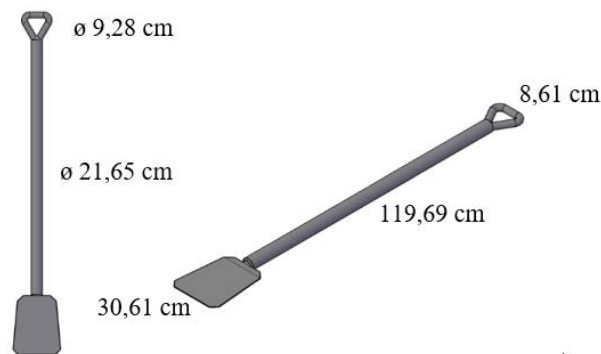
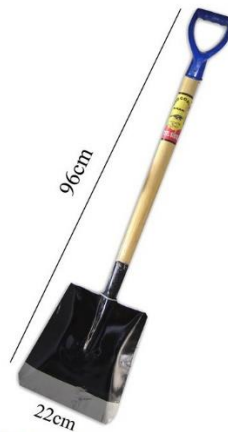


Fig. 1. The design of the palm loose shovel

As for the image of the shovel used previously, it can be seen in Figure 2 as follows:



IV. Conclusion

The conclusions from the research that has been done are as follows:

1. Based on the results of the Quick Exposure Check (QEC) calculation at all workstations in Pulau Tiga PKS, it was found that the riskiest workstation at the loading ramp station had an exposure level of 104.55% with the action category. Research and changes are carried out as soon as possible.

2. Based on the results of the Rapid Upper Limb Assessment (RULA) calculation for three workers at the loading ramp station, the same level score was obtained for all workers, namely 7, with the action category "action now."

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