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Analysis of Improvement of Employee Work Posture Using OWAS Method (case study at PT. XYZ)

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ABSTRACT

PT. XYZ is a service company in the field of construction and fabrication. This study aims to determine the results of work postures in the company and determine the level of risk for operators based on *the nordic Body Map (NBM)* and provide suggestions for improving work posture to the operator. Ovako Work Posture Analysis System(OWAS) is a method for evaluating and analyzing the work attitude of observed operators, including body movements of the back, shoulders, arms, and legs, including thighs, knees, and ankles. This method is fast in identifying work attitudes that have the potential to cause work accidents. Work accidents that are of concern to this method are the musculoskeletal system. It is known that there are 4 work postures from the company PT XYZ, out of these four postures need improvement as soon as possible. It is recommended to pay more attention to the health and safety of operators, especially during disturbances*Musculoskeletal disorders* which are caused by unsuitable work environment conditions and workload which can result in decreased work productivity

Keywords: Swadaya Graha**,** *Musculoskeletal disorders Ovako, Owas Working Analysis System (OWAS)*

Introduction

Workers are a vital resource for carrying out business processes in a company. Workers in manufacturing industrial companies also play a very important role that can support the quality of the product, especially if PT XYZ still applies manual material handling in carrying out its work both in carrying out the process of lifting, carrying, and pushing goods in PT XYZ. so that it still requires skilled human resources. is in it. Manual handling work for employees at PT XYZ[1]–[3] means that each worker is a burden for the person concerned. This burden can be physical or mental; with that, there are several complaints of pain. This should be a severe concern to ergonomic issues and is related to the threat of MSDS (Musculoskeletal Disorders).[4], [5].

Ergonomics can be defined as a discipline that examines the limitations, strengths, and use of information in designing products, environmental machines, and work systems for employees to achieve safe and comfortable quality work.[6]. Ergonomics is a systematic branch of science that provides analysis related to information about human capabilities and limitations in work. So that humans can work optimally in a good system. On the other hand, evaluating the negative impact of potential hazards that may arise in carrying out work is also necessary. For this reason, it can be anticipated that the risks affect workers' health.[7]–[12]. And in ergonomics, it is known that several methods can be used to analyze posture, including the OWAS method. This OWAS method is a method used to measure the body by dividing work activities into several time intervals. With the assessment of working posture, it is hoped that it can reduce cumulative trauma disorders (CDT), which can be caused by excessive use of force during the work process, stiff joint movements, and repetition of the same movements over and over lack of rest. These factors can be minimized according to the grand risk score from the Owas method.[13]–[17]. In the previous study, the researcher used the Owas method, which was previously less effective and inefficient. Therefore, in this study, the researcher continued the previous research with the same method, namely the Owas method, to further improve the risk of MSDS (Musculoskeletal Disorders) so that workers have unsustainable exposure to the disease during the work process.

Research Methods

Data were obtained from interviews with PT PT XYZ operators at the data collection stage. After that, the data will be identified to get complaints that make PT XYZ operators uncomfortable in the work process.

The data collection method used in this study was directly observing the companies under investigation. The collection techniques carried out are as follows:

1. Interviews are a way of obtaining data or information by asking questions now to operators at PT XYZ

2. They distributed NBM questionnaires to obtain data to be processed by researchers using the Ovako Working Analysis System Owas method. Nordic Body Map (NBM) is a method used to analyze the body map shown in each body part. This nordic body map shows which parts of the muscles experience complaints with the level of complaints.[18]–[22]

Table 1. List of Complaints

No.	Location Complaints	Questionnaire Percentage (%)			
		TS	US	S	SS
1	Top Neck	0%	50%	50%	0%
2	Lower Neck	25%	25%	25%	25%
3	Left Shoulder	50%	50%	0%	0%
4	Right Shoulder	0%	75%	25%	25%
5	Left Upper Arm	25%	0%	50%	25%
6	Back	25%	0%	25%	50%
7	Right Upper Arm	25%	25%	50%	0%
8	Waist	0%	0%	50%	50%
9	Butt	50%	50%	0%	0%
10	Lower Butt	25%	75%	0%	0%
11	Left Elbow	50%	0%	25%	25%
12	Right Elbow	25%	25%	0%	50%
13	Left Forearm	0%	50%	50%	0%
14	Right Forearm	50%	50%	0%	0%
15	Left Wrist	25%	25%	25%	25%
16	Right Wrist	0%	50%	50%	0%
17	Left hand	25%	50%	25%	0%
18	Right hand	0%	25%	25%	25%
19	Left Thigh	25%	25%	50%	0%
20	Right Thigh	75%	25%	0%	0%
21	Left Knee	0%	50%	25%	25%
22	Right Knee	0%	25%	50%	25%
23	Left Calf	0%	75%	25%	0%
24	Right Calf	50%	50%	25%	0%
25	Left Ankle	25%	25%	50%	0%
26	Right Ankle	25%	25%	25%	25%
27	Left Foot	0%	50%	50%	0%
28	Right foot	25%	50%	25%	0%

Musculoskeletal disorders (MsDs)

*Musculoskeletal disorder*s a complaint in the muscles that the operator feels, this complaint and pain is usually termed Musculoskeletal disorders (MsDs) or injuries to the Musculoskeletal. This work posture is mainly caused by a mismatch between the dimensions of work equipment and workstations with the size of the worker's body and the worker's behavior. Besides that, this unnatural work posture can also be caused by the following things[23]-[24].

1. Excessive muscle stretching

   Operators often complain about overstimulation of muscles when their work requires a lot of energy, such as carrying, pushing, and carrying heavy workloads. If operators often do the same thing, there is a potential risk of muscle complaints.
2. Unnatural work attitude

   This unnatural work attitude is an attitude that causes the position of the body parts to move away from their natural function, for example, the movement of the hands raised and the back being too bent. The higher the risk of this attitude muscle complaint in general due to the characteristics of task demands and the abilities and limitations of workers.[25]
3. Repetitive activity

   Repetitive activity is work done continuously. This muscle complaint occurs because the muscles receive pressure due to continuous workload without giving rest[26].

Ovako Working Analysis System Owas (OWAS) method

Owas is a method used to measure an employee's body. The measurement principle used is the overall work activity concept of measuring body posture so that operators can work safely. This method is used to classify work postures and loads during production. Body posture is analyzed and then given a value to be organized. This Owas aims to identify occupational risks that can harm the working human body[27].

This assessment is used to correct position positions at risk for accidents. Evaluation of working posture can be shown as follows[28]:

1. Assessment on the back (back) is given a criterion value of 1 to 4:

Figure 1. Assessment on the back (back) is given a criterion value of 1 to 4

2. Assessment of the arms (Arms) is given Criteria for a value of 1 to 3:

Figure 2. Assessment of the arms (Arms) is given Criteria for a value of 1 to 3

3. Assessment of the legs (legs) is given criteria 1 to 7:

Figure 3. Assessment of the legs (legs) is given criteria 1 to 7

4. Assessment of workload (load) is given criteria 1 to 3:

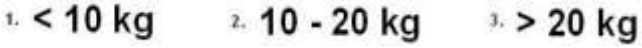

Figure 4. Assessment of workload (load) is given criteria 1 to 3

Table 2 Assessment of Owas Work Posture Analysis

Back	Arms	1			2			3			4			5			6			7			Legs
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Load
1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1
	2	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	
	3	1	1	1	1	1	1	1	1	1	2	2	3	2	2	3	1	1	1	1	1	2	
2	1	2	2	3	2	2	3	2	2	3	3	3	3	3	3	2	2	2	2	2	3	3	
	2	2	2	3	2	2	3	2	3	3	3	4	4	3	4	4	3	3	3	2	3	4	
	3	3	3	4	2	2	3	3	3	3	3	4	4	4	4	4	4	4	4	2	3	4	
3	1	1	1	1	1	1	1	1	1	2	3	3	3	4	4	4	1	1	1	1	1	1	
	2	2	2	3	1	1	1	1	1	2	4	4	4	4	4	4	3	3	3	1	1	1	
	3	2	2	3	1	1	1	2	3	3	4	4	4	4	4	4	4	4	4	1	1	1	
4	1	2	2	3	2	2	3	2	2	3	4	4	4	4	4	4	4	4	4	2	3	4	
	2	3	3	4	2	3	4	3	3	4	4	4	4	4	4	4	4	4	4	2	3	4	
	3	4	4	4	2	3	4	3	3	4	4	4	4	4	4	4	4	4	4	2	3	4	

This OWAS work posture analysis consists of 4 levels of a scale of work attitudes that are dangerous for operators, including[29]:

1. Category 1: Safe, or no need to improve work posture
2. Category 2: potential for musculoskeletal and need to improve working posture in the future.
3. Category 3: this attitude has the potential for musculoskeletal damage and must be corrected immediately.
4. Category 4: This error is very dangerous and must be corrected immediately.

Results and Discussion

From the results of the discussion, researchers can analyze the results that have been carried out during research at PT PT XYZ, as follows:

1. Process of Cutting Marking

Figure 5. Process of Cutting Marking

Table 3 cutting markings

Cutting marking process	
Back Posture	Bend forward
Arm Attitude	Both arms are under the shoulders
Foot stance	Stand with straight legs
Workload	Load weight less than 10 Kg

From the analysis of the picture above, it is obtained with the results of the Owas code 2-1-2-1, with a risk level of 2 which means that this work posture is dangerous for the musculoskeletal system, which results in a significant effect of tension. And it is necessary to improve work posture in the future.

2. Fit-Up Process

Figure 6. Fit-Up Process

Table 4 Fit Up

Fit-Up Process	
Back Posture	Bend forward
Arm Attitude	Both arms are under the shoulders
Foot stance	Squat with both feet

Workload	Load weight less than 10 Kg

From the analysis of the image above, it is obtained with the results of the Owas code 2-1-6-1, with a risk level of 2 which means this attitude is dangerous for the musculoskeletal system, which results in a significant effect of tension. And it is necessary to improve work posture in the future.

3. Finishing Process 1

Figure 7. Finishing Process 1

Table 5 Finishing

Finishing Process 1	
Back Posture	Bend forward
Arm Attitude	Both arms are under the shoulders
Foot stance	Stand with straight legs slightly bent
Workload	Load weight less than 10 Kg

FromThe analysis of the picture above is obtained with the results of the Owas code 2-1-4-1, with a risk level of 3 which means this attitude is dangerous for the musculoskeletal system, which results in a significant effect of tension. And it is necessary to improve work posture as soon as possible.

4. Finishing Process 2

Figure 8. Finishing Process 2

Table 6 Finishing

Finishing Process 2	
Back Posture	Bend forward
Arm Attitude	Both arms are under the shoulders
Foot stance	Squat with both feet
Workload	Load weight less than 10 Kg

From the analysis of the image above, it is obtained with the results of the Owas code 2-1-6-1, with a risk level of 2 which means this attitude is dangerous for the musculoskeletal system, which results in a significant effect of tension. And it is necessary to improve work posture in the future.

Data analysis

The data analysis here is the work of data processing, where the data entered is the work posture data of the PT XYZ operators. The following is a list of operator postures in accordance with data processing:

Table 7. Data analysis

No	process	posture	Code	Category
1.	Cutting Marking	1	2121	2
2.	Fit Up	2	2161	2
3.	finishing	4	2141	3
4.	Packing	7	2161	2

Judging from the table above, there are three postures that fall into category 2 and one work posture that falls into category 3, which means that the activity has musculoskeletal potential.

Recommendations for improving work posture

It can be seen that there are some operators who have postures that have dangerous working postures or have the potential to affect the musculoskeletal, so these operators need posture improvement in order to reduce potential or eliminate musculoskeletal risks. The following is a table of recommendations for improvement for PT XYZ operators:

1. Process of Cutting Marking

Table 8. OWAS calculations

Process	Initial Posture	Proposed Posture
Cutting markings	Code 2121 Leaning attitude→bow Arm stance→both arms are under the shoulders Foot stance→stand on straight legs Carry out metal-cutting activities using a cutting machine Category 2	Code 1121 Back posture→Straight Arm stance→both arms are under the shoulders Foot stance→stand on both feet Category 1

2. Fit-Up Process

Table 9. OWAS calculations

Process	Initial Posture	Proposed Posture
Fit Up	Code 2161 Leaning attitude→bow Arm stance→both arms are under the shoulders Foot stance→Kneel on one or both knees Carry out drilling activities using a drilling machine Category 2	Code 1111 Back posture→Straight Arm stance→both arms are under the shoulders Foot stance→Sit down Carry out activities in a higher field Category 1

3. Finishing Process

Table 10. OWAS calculations

Process	Initial Posture	Proposed Posture
finishing	Code 2141 Leaning attitude→bow Arm stance→both arms are under the shoulders Foot stance→Stand on both feet with knees bent Carry out the finishing process using a grinding machine Category 3	Code 1121 Back posture→Straight Arm stance→both arms are under the shoulders Foot stance→stand on straight legs Do activities on the table Category 1

4. Packing Process

Table 11 OWAS calculations

Process	Initial Posture	Proposed Posture

Packing	Code 2161	Code 1111
	Leaning attitude→bow	Back posture→Straight
	Arm stance→both arms are under the shoulders	Arm stance→both arms are under the shoulders
	Foot stance→Kneel on one or both knees	Foot stance→Sit down
	Category 2	Carry out activities in a higher field
		Category 1

Conclusion

Based on the identification of worker postures using the OWAS method, the results of the analysis show that for work postures when carrying out the Cutting Marking, Fit Up, and Packing processes, a risk level of 2 is obtained, which means that this posture requires changes in posture in the future to minimize musculoskeletal complaints. For work postures on, when carrying out the finishing process, you get a risk level of 3, which means that this posture requires a change in body posture as soon as possible to minimize musculoskeletal complaints and the working posture of PT. PT XYZ has a non-ergonomic working posture. So it is necessary to improve work posture in the Cutting Marking, Fit Up, Packing, and Finishing processes to minimize the occurrence of musculoskeletal complaints and to increase productivity at work.

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