

***RISK ANALYSIS OF THE PACKING PROCESS AT THE LOGISTICS DEPARTMENT OF PT. XYZ USED REBA METHOD***

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**ABSTRACT**

*PT. XYZ is a company that produces automotive and is one of the largest in Asia. PT. XYZ produces various types of springs, both leaf springs and conch springs which have been licensed by Mitsubishi Steel Manufacturing, Japan. Products from PT. XYZ will be exported to several countries such as the United States, Japan and India. In shipping can not be separated from the packaging process. In the packing process which is still done manually by material handling, it is found that the work posture is not good or not ergonomic, namely the bent posture so that if it is done for a long period of time it can trigger complaints of Musculoskeletal Disorders and will cause losses for both workers and companies. This study aims to know the level of risk and work posture of workers. The method in this study is by using the REBA method, from the results of processing and analyzing the data obtained in this study, it gets a grand score of 10 which indicates it has a fairly high level of risk and needs to be taken action. The action that must be taken is a change in work posture in manual material handling activities in the packing process so as to minimize the occurrence of Musculoskeletal Disorders.*

**Keywords :** *Reba, MSDs, Work posture*

**1. Introduction**

A company engaged in the production automotive springs for vehicles that produce both leaf springs and conch springs, the products produced can be categorized into three groups, namely : OEM (Original Equipment Manufacturing), Export, After Market. Every work activity in a company certainly has its own risks, as well as in the spring packing process. Postures that require workers to stand/bend for long working hours will definitely put pressure on the nerves and muscles of the body, causing disturbances and complaints to workers. If the body posture is not ergonomic in doing work, it will cause muscle problems such as back pain, shoulder pain, neck pain.

In the packing process, it is found that the material handling process is lifting the spring which weighs more than 10kg. Figure 1 is a work posture in the packing process with manual material handling.



Fig 1. Employee work posture

## 2. Literature Review

The production process of a company must go through several stages, starting from preparing raw materials to the packing process (Hasanah et al., 2020). In developing countries, especially in Indonesia, there is still an industry that utilizes the strength of human muscles in moving materials. Some industries have actually switched to modern industries, but still most developing countries prefer to use manual material handling as their habit because considering the cost is much cheaper than using technology or using tools. (Salsabila et al., 2022). Direct material control with human labor is an activity that must always exist in a manufacturing company (Umami et al., 2014). One example is the packing process which is done without using machines or done manually by material handling. Material Handling Manual is an activity of a worker that is carried out directly with human strength either in the form of raw materials or finished products from an industry which when not done ergonomically will result in an incident at work. (Rizana et al., 2022). Manual material handling (MMH) activities that are not up to standard can be a cause of danger to unwanted incidents for someone doing a job. (Muslimah et al., 2006). Manual material handling activities are in the form of pushing, pulling, lifting, shifting and activities carried out directly with other human workers who do not use work aids (Margaretha, 2022). The packing process is carried out by lifting goods directly by human power and carried out many times in long working hours, so that in carrying out the work, the level of ergonomics is an important thing for a job to be effective, efficient.

Ergonomics is a systematic field of knowledge that studies the characteristics, abilities, and limitations of a person to design a work environment (Rosyati et al., 2019). Ergonomics is also related to the optimization, effectiveness, health and safety of people wherever they are (Restuputri, 2017). The scope of ergonomics is not only about how to manage a good and proper body condition and posture but is also related to technique, anthropometry, and design. (Andriani & Erfani, 2017). The aim of ergonomics is to design systems that are appropriate to the physical limitations and characteristics of workers, such as working conditions, working methods, equipment and machinery, and the work environment (e.g., sound and lighting). The more precise, the higher the level of safety and work efficiency (Mayangsari et al., 2020). Therefore, it is necessary to measure the ergonomics of workers to determine the suitability of work with work equipment. The purpose of the application of ergonomics is to minimize injuries and disturbances related to work in which the work posture is wrong and is done repeatedly and can reduce stress (Posture & Field, 2021). One of the focuses of ergonomics is on work posture. In order to obtain and maintain the condition of the workers' bodies so that they are in excellent condition, the work must be carried out according to the correct procedure (Rivai et al., 2014).

One of the non-ergonomic work postures is bending in doing manual material handling. Poor posture during work and in long working hours can cause complaints to the body's muscular system and have a negative impact on health (Kumalapatni et al., 2020). Diseases from work activities caused by unfavorable or less ergonomic working conditions, namely musculoskeletal disorders (MSDs) (Hardima et al., 2018). An activity that causes this disease is a job that is done many times, system less work nature, and working conditions that require workers to carry out their work in unsuitable working conditions (Andrian & Renilaili, 2021). In the process of lifting objects, the back condition should not be too bent, so that the working position is more comfortable, and must use supporting equipment to avoid musculoskeletal disorders (Nurcahyani & Tarwaka, 2021). Doing activities with awkward postures for a long time and repeatedly can cause damage and discomfort to the nerves and muscle tissue of the body (Sulaiman & Sari, 2016). Early fatigue of a worker can also lead to illness as well as accidents that can lead to disability and, in the worst cases, death. (Mesra, 2021). Musculoskeletal disorders (MSDs) are complaints or mild pain before a person feels severe pain in the musculoskeletal system, including joints, nerves, muscles and spine due to improper work posture (Sholeha & Sunaryo, 2022). Complaints of Musculoskeletal Disorder can be used as a main reason by workers to get permission from their responsibilities as workers and cause losses to the company in terms of time, material, and service. (Saftarina & Simanjuntak, 2017). One way to find out the level of work posture and minimize MSDs is to use the REBA method

REBA serves to provide an assessment of a posture risk that can trigger a complaint in the

MSDs system(Yudiardi et al., 2021). Analysis of a worker's body posture using the REBA method is useful for designing a worker's body posture that is safe and comfortable when doing his job(Nur 'ainiyah et al., 2022). Rapid Entire Body Assessment (REBA) is a science in the field of ergonomics that can be applied accurately and quickly to determine the posture, neck, arms, wrists, and feet of a person in doing a job.(Setiorini et al., 2019). Preliminary analysis of the body posture of a job that produces scores with high indicators, it is proposed to apply a new work posture that has a lower and safer level of posture.(Umboh et al., 2018). The use of work aids can provide optimal results, so it needs to be adjusted to their behavior and effects on the body(Surya, 2017).

**3. Research Methods**

This research was conducted at PT. XYZ. One of the companies that produces automotive springs, the method used in this study is to use the REBA (Rapid Entire Body Assessment) method. The data used in this study are employee work posture data and data on Musculoskeletal disorders complaints. logistics for packing. Observations were made to obtain work posture data by documenting or taking photos of workers while doing work and collecting data by conducting interviews and filling out Nordic Body Map questionnaires with competent people (workers) on the data needed by researchers.

Processing of employee work postures by calculating the angle of work posture using Autocad software and proceeding with the calculation of the final score using the REBA method and calculating the complaints on body parts contained in the Nordic Body Map in order to obtain risk data and worker complaints against Musculoskeletal disorders.

**4. Results and Discussions**

**Complaints of Musculoskeletal Disorders**

Data on Musculoskeletal Disorders complaints were obtained through distributing and filling out Nordic Body Map questionnaires to several (out of 5 logistics packing workers) workers who were in the workplace. The following is the data obtained.

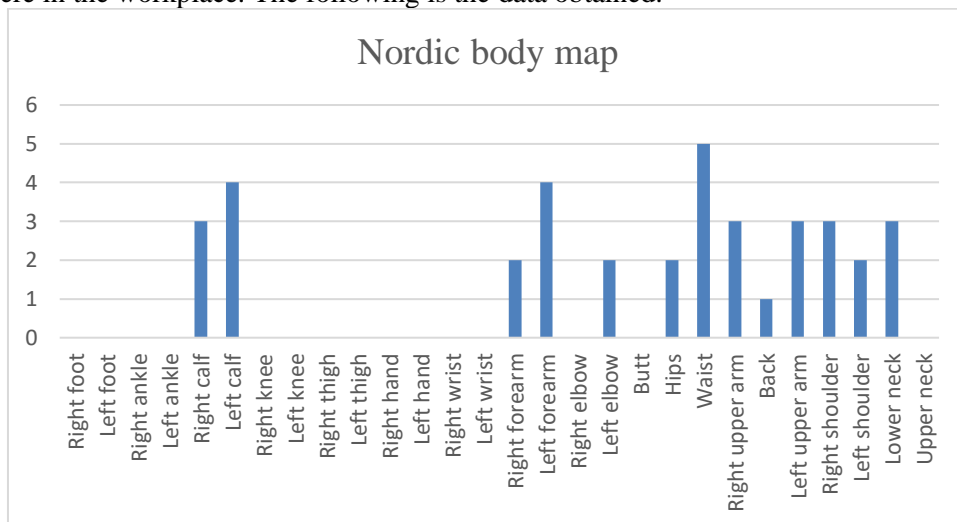


Fig 2. Nordic Body Map Data

From figure 2 above, it is known that the highest complaints are at the waist, namely 5 people, the left forearm, 4 people and complaints on the left calf as well as 4 people from the data, it shows that there are complaints of Musculoskeletal Disorder and improvements are needed.

**REBA (Rapid Entire Body Assessment)**

Work posture data obtained by direct observation of workers in the packing section of PT. XYZ ( can be seen in figure 1. ). The following work posture data consists of 3 groups, namely group A, group B and group C

**Group A calculations (body, legs and neck)**

- a. From the work posture data, it can be seen that the body posture forms an angle >60°, so the score obtained = 4
- b. From the work posture data, it can be seen that the movement of the neck forms an angle of 27°, so the score obtained = 2
- c. From the work posture data, it can be seen that the condition of both feet is well footed and bent in flexion (30°-60), so the score obtained is 1 + 1 = 2

Table 1 - Score table A work posture

<b>TABLE A</b>												
<i>Neck</i>												
<i>Body</i>	<b>1</b>				<b>2</b>				<b>3</b>			
	<i>Legs</i>				<i>Legs</i>				<i>Legs</i>			
	1	2	3	4	1	2	3	4	1	2	3	4
<b>1</b>	1	2	3	4	1	2	3	4	3	3	5	6
<b>2</b>	2	3	4	5	3	4	5	6	4	5	6	7
<b>3</b>	2	4	5	6	4	5	6	7	5	6	7	8
<b>4</b>	3	5	6	7	5	6	7	8	6	7	8	9
<b>5</b>	4	6	7	8	6	7	8	9	7	8	9	9

<b>Burden</b>				
<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	
< 5	5-10	>10	Addition	
kilograms	kilograms	Kilograms	sudden	

Then the total score of group A = 8

**Group B calculations (upper arm, forearm and wrist)**

- a. Based on the work posture, it can be seen that the movement of the upper arm forms an angle between 45°-90 so the score obtained = 3
- b. From the work posture data, it can be seen that the movement of the forearm forms a blade between 60°-100° so the score obtained = 1
- c. From the work posture data, it can be seen that the movement of the wrist forms an angle of 15° and experiences a circular movement so that the score obtained = 2
- d. The position of the grip is strong and right in the middle = +0

Table 2 - Score table B work posture

<b>TABLE B</b>						
<i>fore arm</i>						
<i>Upper arm</i>	<b>1</b>			<b>2</b>		
	<i>Wrist</i>			<i>Wrist</i>		
	1	2	3	1	2	3
<b>1</b>	1	2	2	1	2	3
<b>2</b>	1	2	3	2	3	4
<b>3</b>	3	4	5	4	5	5
<b>4</b>	4	5	5	5	6	7
<b>5</b>	6	7	8	7	8	8

Then the total score of group B = 4

**Group C calculation ( Group B calculation + group A )**

Table 3 - Score table C working posture

<b>TABLE C</b>												
<b>SCORE A</b>				<b>SCORE B</b>								
<b>A</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>1</b>	1	1	1	2	3	3	4	5	6	7	7	7
<b>2</b>	1	2	2	3	4	4	5	6	6	7	7	8
<b>3</b>	2	3	3	3	4	5	6	7	7	8	8	8
<b>4</b>	3	4	4	4	5	6	7	8	8	9	9	9

<b>5</b>	4	4	4	5	6	7	8	8	9	9	9	9
<b>6</b>	6	6	6	7	8	8	9	9	10	10	10	10
<b>7</b>	7	7	7	8	9	9	9	10	10	11	11	11
<b>8</b>	8	8	8	9	10	10	10	10	10	11	11	11
<b>9</b>	9	9	9	10	10	10	11	11	11	12	12	12
<b>10</b>	10	10	10	11	11	11	11	12	12	12	12	12
<b>11</b>	11	11	11	11	12	12	12	12	12	12	12	12
<b>12</b>	12	12	12	12	12	12	12	12	12	12	12	12

- a. Final score calculation table C = 9
- b. Muscle performance score = 1
- c. Total REBA final score = 10

The results in calculations using the REBA method during manual material handling activities when packing leaf springs get a score of 10, so further research is required and immediately repairs the work system.

From the results of calculations that show the results so that immediate action is taken, the researchers provide solutions for work aids that can ease the burden on workers, which can be seen in figure 3.

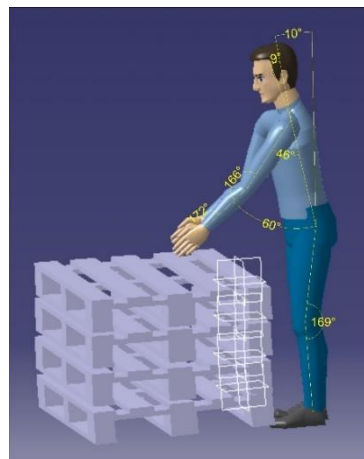


Fig 3. Proposed work posture improvement

Figure 3 is a suggestion for improvement by adding or using pallets under the goods to be packed, this is useful for improving posture so that it is not too bent and also does not cost a lot so it can be a proposal for improvement.

**Group A calculations (body, legs and neck)**

- a) Posture forms an angle of 10°, so the score you get = 2
- b) The movement of the neck forms an angle of 9°, so the score obtained = 1
- c) the condition of both legs is well supported and bent in flexion (30°-60), so the score is 1+1=2

Table 4 - Score table A proposed improvements

TABLE A												
Neck												
Body	1				2				3			
	Legs				Legs				Legs			
	1	2	3	4	1	2	3	4	1	2	3	4
<b>1</b>	1	2	3	4	1	2	3	4	3	3	5	6
<b>2</b>	2	3	4	5	3	4	5	6	4	5	6	7
<b>3</b>	2	4	5	6	4	5	6	7	5	6	7	8
<b>4</b>	3	5	6	7	5	6	7	8	6	7	8	9
<b>5</b>	4	6	7	8	6	7	8	9	7	8	9	9

Burden			
0	1	2	3
< 5	5-10	>10	Addition sudden
Kilograms	Kilograms	Kilograms	

Then the total score of group A = 5

**Group B calculations (upper arm, forearm and wrist)**

- a) The movement of the upper arm forms an angle between 20°-45° so the score obtained = 2
- b) The movement of the forearm forms an angle of 60° so the score obtained = 1
- c) The movement of the wrist forms an angle of 8° and undergoes a circular movement so that the score obtained = 2
- d) The position of the grip is strong and right in the middle = +0

Table 5 - Score table B proposed improvements

TABLE B						
<i>fore arm</i>						
Upper arm	1			2		
	Wrist			Wrist		
	1	2	3	1	2	3
1	1	2	2	1	2	3
2	1	2	3	2	3	4
3	3	4	5	4	5	5
4	4	5	5	5	6	7
5	6	7	8	7	8	8

Then the total score of group B = 2

**Group C calculation ( Group B + group A calculation )**

Table 6 - Score table C proposed improvement

TABLE C												
SCORE	SCORE B											
A	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	2	3	3	4	5	6	7	7	7
2	1	2	2	3	4	4	5	6	6	7	7	8
3	2	3	3	3	4	5	6	7	7	8	8	8
4	3	4	4	4	5	6	7	8	8	9	9	9
5	4	4	4	5	6	7	8	8	9	9	9	9
6	6	6	6	7	8	8	9	9	10	10	10	10
7	7	7	7	8	9	9	9	10	10	11	11	11
8	8	8	8	9	10	10	10	10	10	11	11	11
9	9	9	9	10	10	10	11	11	11	12	12	12
10	10	10	10	11	11	11	11	12	12	12	12	12
11	11	11	11	11	12	12	12	12	12	12	12	12
12	12	12	12	12	12	12	12	12	12	12	12	12

- a) Final score calculation table C = 4
- b) Muscle performance value = 1
- c) Total REBA final score = 5

**5. Conclusion**

The results of the analysis using the REBA (Rapid Entire Body Assessment) method at PT. XYZ in the packing section shows that it can be high risk and can cause Musculoskeletal Disorders, this can be seen in the results of the REBA grand score which shows a result of 10 so

improvements must be made immediately. Improvements that must be made are changes in work posture during the packing process so that the posture is not too heavy when doing it. Therefore, to improve work posture, work aids are needed with the aim of reducing the risk of MSDs. Suggestions for improving work posture in the form of adding pallets under the goods to be packed, things that are useful for improving posture so that it is not too much and also does not cost money. Comparison of the initial work posture and the proposed proposal, there are differences in work postures that are not and are more ergonomic, this is evidenced by calculations that show the REBA grand score, which is the result of indicators that are in the medium category. And it is recommended to stretch the muscles for 10-15 minutes in the morning or at any time before doing work.

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