Conference Paper

Work Posture Analysis with Rapid Entire Body Assessment (REBA) Method on Production Operators At PT. Prestasi Ide Jaya Mojokerto

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*Corresponding author: E-mail: rusindiyanto4@gmail.com	ABSTRACT
	Heavy workload and non-ergonomic facility layout design will result in the excessive labor force and wrong body position. PT. Prestasi Ide Jaya produces slippers and Eva sponges. Eva sponge is the base used in the manufacture of soles or parts of sandals. From the observations that have been made on the production floor of slippers and Eva sponges, there are still non-ergonomic production operator activities, namely in the mixing, cutting, and packing processes. The objectives to be achieved in this study are to improve the position of production operators in the company using the Rapid Entire Body Assessment (REBA) method and provide suggestions for improving work postures and facilities by the results of the posture assessment using the Rapid Entire Body Assessment (REBA) method. The results of the study stated that the insole screen printing section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score, the flipflops assembly section workers got a category five score as a moderate level of risk and require preventive action.
	Keywords: Ergonomic work position, REBA (Rapid Entire Body Assessment) method

Introduction

Ergonomics is the study of systems in which humans, work facilities, and their environment interact to adapt the work atmosphere to humans (Restuputri & Wibisono, 2017). Every company is obliged to meet the needs of its workers by the ergonomics system because workers are an important asset for the company. However, many companies still do not apply Standard Operating Procedure (SOP) and work facilities for ergonomic production processes and follow the worker's body posture, causing workers to often experience discomfort in their body parts (Nazlina et al., 2008). These complaints will not occur if workers work in a comfortable position because work comfort is important (Raliby et al., 2008).

PT. Prestasi Ide Jaya is a company that produces slippers and Eva sponges. Eva sponge is the basic material used in the manufacture of soles or sandals. The work unit at PT. Prestasi Ide Jaya is divided into 2, namely the Eva sponge work unit and the sandal work unit. The work method applied by the operator must be precise so that there is no waste and abnormal positioning. The presence of an abnormal working position will cause complaints of pain to the operator, for example, pain in the neck, shoulders, waist, back, hands, knees, calves, and feet. One of the efforts that can be done to overcome this is to improve the work method from a non-ergonomic work position to an ergonomic work position.

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From the results of observations on the production of sandals, work stations that are not ergonomic are the insole screen printing, plong-cutting, flip-flop assembly, finishing, and packing. Given these problems, an ergonomic work position analysis study was conducted in the production process to reduce workers' pain complaints using the Rapid Entire Body Assessment (REBA) method. REBA is a method developed in ergonomics and can be used to quickly assess the working position or posture of an operator's neck, back, arms, wrists, and legs. In addition, this method is also influenced by coupling factors, external loads supported by the body, and worker activities. One of the things that distinguish the REBA method from other analytical methods is that in this method, the focus of analysis is all parts of the worker's body (Hignett & Mcatamney, 2000). Through this focus on overall body posture, it is hoped that it can reduce the potential for musculoskeletal disorders in the body of workers. By knowing the errors that have been researched, the purpose of this study is to provide suggestions for improving work postures and improving facilities by the results of the work posture assessment using the Rapid Entire Body Assessment (REBA) method.

Literature Review

The term "ergonomics" comes from the Latin words ergon (work) and nomos (natural law) or can be defined as the study of human aspects in the work environment, which is reviewed anatomically, physiologically, psychologically, engineering, management, and design. Ergonomics is also known as "human factors" Various kinds of experts/professionals also use ergonomics, for example, anatomist, architecture, industrial product design, physics, physiotherapy, occupational therapy, psychology, and industrial engineering (IEA, 2003). In addition, ergonomics can also be applied to physiology, psychology, design, analysis, synthesis, evaluation of work processes and products for entrepreneurs, managers, government, military, lecturers, and students (Nurmianto, 2006).

Nordic body map

The Nordic Body Map method consists of 27 question items that are commonly used especially for ergonomics research. The body dimensions studied in the Nordic Body Map can be seen in Figure 1.

200	
 Upper neck Left shoulder Right shoulder Left upper arm Back Right upper arm Waist Buttocks Ass Left elbow Right elbow Right forearm Right forearm Left wrist 	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.

Figure 1. Nordic Body Map (Setiadi & Poerwanto, 2013)

REBA (Rapid Entire Body Assessment)

Work posture is a determining point in analyzing the effectiveness of a job (Susihono & Prasetyo, 2012). Different work attitudes will produce different strengths. Working with the correct work posture will create comfort so that workers can perform optimally. The movement of body organs greatly affects work posture. The REBA or Rapid Entire Body Assessment method is known to analyze the activity of body organs and work postures. Rapid Entire Body Assessment (REBA) has been developed to meet the need for a method specifically designed to analyze the body posture of workers, especially in the health and industrial fields. REBA is designed to evaluate a job that causes discomfort in the limbs at work (back, neck, shoulders, upper arms, forearms, wrists, feet) (Hignett & Mcatamney, 2000).

Material and Method

Measurement in the REBA method is using REBA software. This software will integrate the process of analyzing posture and work movements starting from the angle calculation process, determining the angle range, coupling, the load being lifted to the level of risk, and corrective action. In addition, there is also a database facility to store calculated postures and also a printing facility.

Result and Discussion

The explanation of the results of the REBA measurements that have been carried out is as follows:

Work position data for insole screen printing



Figure 2. The working posture of the insole screen printing section

From Figure 2, it can be seen that workers carry out screen printing activities on a table with a slightly bent position.

- a. Position Body Group A
 - Position of the body part (trunk) The torso/back forms an angle of 20°- 60° with a score of 3.
 - Position of the body neck (neck) The neck forms an angle of 0°- 20° with a score of 1.
 Pade available a fille base filles
 - Body position of the legs (legs)
 The position of the legs is bent sideways and unbalanced with a score of 2, and the knees form between 30° 60° = 1, so a score of 3.

b. Group B tubuh body position

- The position of the upper arm (upper arm). The position of the arm forms an angle of 45° - 90° working with shoulder shrugs and arm support with a score of 3.
- Lower arm position.
 The position of the right forearm is more/less than 60°- 100° with a score of 2.
- The position of the body part of the wrist (Wrists). The body position of the right and left wrists form an angle of 0°-15° with a score of 1.

- The load lifted is about 20kg, the grip position (coupling) is good, with the activity of changing posture + 1.
- REBA procedure software calculation
 Worker Calculation Steps for Insole Screen Printing. In the submenu (trunk), select an image that shows the back position at an angle of 20°-60°. The automatic score shows number = 3 (can be seen in Figure 3).



Figure 3. Trunk Score

In the Neck submenu, select an image that shows the neck position at an angle of $0^{\circ}-20^{\circ}$. The automatic score shows number = 1 (can be seen in Figure 4).

Group A - Trunk, Neck and Legs					
Trunk:	Ś		Ú.	And the second s	
	Back twisted tilted to the s	or side	Frunk Sco	re	
Neck:	F.J:	ŦĿ	Neck twi tilted to	isted or the side	
	0 ⁴ - 20 ⁴ Healer	24" Plates er	Neck	Score 1	
Legs:		<u>76</u>	- D		
	Leg Sco	re			

Figure 4. Neck Score

In the Legs submenu, select an image that shows the foot's position at an angle of $0^{\circ}-0^{\circ}$ and with a side-supporting position. The automatic score shows number = 2 (can be seen in Figure 5).

Group A - Trunk, Neck and Legs					
Trunk:	() 		B. HP Parties 30 - HP Parties		
	Back twisted tilted to the s	or pide	runk Sco	re	
Neck:	63:	÷	Neck twis tilted to t	ted or he side	
	0° - 29' Phasice	26° Piedon er	Neck	Score	
Legs:	<u>F</u>	terretaria antificia postaria. Del	- De	State Life Dages	
Leg Score 2					

Figure 5. Legs Score

In the upper arm (right) submenu, select the image that shows the position of the upper arm at an angle of 20° - 45° with the shoulder reaching. The automatic score shows number = 3 (can be seen in Figure 6).

Group B- Upper Arms (Shoulders)					
Right Arm:		Laster 19:45	Pastor 45° 30°	Pastor + SP	
	Arm Abducter Rotated	d / Should	er Reised	Arm Supported	
1 - 44	Right A	rm Score	3		
Arm:	Sand Street Street		Finales 40° 80°	Plaster > 07	
Arm Abducted / Rotated Shoulder Reised Arm Supported					
Left Arm Score					

Figure 6. Upper Arm (Right) Score

In the upper arm (left) submenu, select the image that shows the position of the upper arm at an angle of $20^{\circ}-45^{\circ}$ with the shoulders reaching. The automatic score shows number = 3. In the lower arm (right) submenu, select the image that shows the forearm position at an angle of less than $60^{\circ}-100^{\circ}$. The automatic score shows number = 2. In the lower arm (left) submenu, select the image that shows the forearm position at an angle of less than $60^{\circ}-100^{\circ}$. The automatic score shows number = 2. In the lower arm (left) submenu, select the image that shows the forearm position at an angle of less than $60^{\circ}-100^{\circ}$. The automatic score shows number = 2. In the Wrist submenu, select an image that shows the position of the right and left wrists at the same angle, i.e., $0^{\circ}-15^{\circ}$. The automatic score indicates the number 1. In the activity score submenu, select the image of the load being lifted less than 5kg with a score of 0, the clutch position (coupling) shows well with a score of 0, and activity (activity) shows (repeat small range motions more than 4 minutes) if the activity causes major changes or in unstable footing with a score of 1 (can be seen in Figure 7).



Figure 7. Activity score

The score results from all software calculations (REBA procedure) are shown by grand scores = 5 and 5 (can be seen in Figure 8).



Figure 8. Results Score

The value (action level) is obtained from the results of the REBA score for the left hand, and the right-hand side is a MEDIUM risk level and requires preventive action.

Proposed repair of insole screen printing section workers

- 1. The angle of the trunk position needs attention because it has an angle of $20^{\circ}-60^{\circ}$ with a score = 3. Proposed improvements are required by changing the back angle (trunk) to 0° with a score = 1.
- 2. The body position of the legs (legs) needs attention because it is not balanced with a score of = 3. By correcting the position of the same footstool, the foot position will be balanced with a score of = 2.
- 3. The position (upper arm) of the right and left upper arms need attention because the upper arm (right) forms an angle of 45° 90° and must raise the shoulders with a score of 3. The following proposal is to eliminate the shrug position (shoulder raised) and changing the angle of the position of the upper arm (right) with 0° 20° will get a score of 0 as well as the left upper arm that must change the position of the shoulder raised (shoulder raised) with the help of the arm (arm support) and gets a score of 0.
- 4. The load lifted must be reduced, which was initially 20kg with an initial score= 2. The load lifted to half of the initial load of 10kg with a proposed score = 1.

The proposed improvement above can produce a grand score that is smaller than the initial body position. The scoring simulation can be seen in Figures 9-12.

	4. Wrists	5 Load / Force, Couple	g.Activity	
1. Trunk	, Neck, Legs	2. Upper Arms	- Y	3 Lover Arms
Grou	p A - Tr	unk, Ne	ck and	Legs
Trunk:	() () () () () () () () () () () () () (¥75 1913	All States	J.J.J." Bit Danker
	Back twisted tilted to the s	or]	runk Sco	ore 1
Neck:	F.):	E.	Neck to tilted to	visted or the side
	0" - 29" Plaster	20" Plasion or in extension	Neck	Score 1
Legs:	Ministration and the section of the	<u>denerationers</u>	- Den ser de la companya de la compa	Series of a constraint of the series
	Leg Scor	e 2		

Figure 9. The value of the proposed improvement group A

_	4 Wisb	5 Load / Force, Co	upling, Activity	
1.1	Inunk, Neck, Legs	2. Upper A		3 Lower Aims
Gro	up B- U	pper Ar	ms (She	oulders)
Right Arm:	Finalen & Str Cristikien & Str	Pasion 201- 607	Paulon 49° 60°	95 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Arm Abducte Rotated	ad / Should	der Roised	Arm Supported
	Right A	rm Score	• 0	
Left Arm:		Sector St.	Factor 67-80*	Pandam > 0P
	Arm Abducte Rotated	ed / Should	der Roised	Ann Supported
	Left Arr	n Score	0	

Figure 10. The value of the proposed improvement group B



Figure 11. The final score of the proposed improvement result

	REBA - Risk Levels			
Left	Hand Side	Right Hand	Side	
Low		Low		

Figure 12. Value of proposal (action level) risk level

Conclusion

From the results of observations and discussions that have been carried out, the following conclusions can be drawn:

- 1. From the results of the scoring using the REBA Procedure software,
 - Workers in the insole screen printing section scored category 5 with a moderate level of risk and needed immediate preventive action.
 - Plong-cutting workers get a category 7 score with a moderate level of risk and need immediate preventive action.
 - The flip-flops assembly worker gets a category 5 score with a moderate level of risk and needs immediate preventive action.
 - Finishing workers score category 5 with a moderate level of risk and need immediate preventive action.
 - Workers in the packing division score category 5 with a moderate level of risk and need immediate preventive action.
- 2. Proposed position improvement using REBA Procedure software,
 - a. Insole screen printing workers
 - Proposed improvements are needed by changing the trunk angle to 0° with a score = 1.
 - By fixing the same footstool position, then the foot position will be balanced with a score = 2.
 - The lifted load is half of the initial load of 10kg with a proposed score of 1.
 - b. Plong cutting workers
 - Proposed improvements are needed by changing the trunk angle to 0°- 20° with a score of = 2.
 - The neck (neck) position, the position of turning or bending the neck, is eliminated and gets a score of 1.
 - Fixing the same footstool position, then the foot position will be balanced with a score = 2.
 - c. Flip-flops assembly worker
 - Proposed improvements are needed by changing the trunk angle to 0°- 20° with a score of = 2.
 - The neck (neck) position, the position of turning or bending the neck, is eliminated and gets a score of 1.
 - Fixing the same footstool position, then the foot position will be balanced with a score = 2.
 - d. Finishing workers
 - Proposed improvements are needed by changing the trunk angle to 0°- 20° with a score of = 2.
 - The neck (neck) position, the position of turning or bending the neck, is eliminated and gets a score of 1.
 - Fixing the same footstool position, then the foot position will be balanced with a score = 2.
 - e. Packing worker
 - Proposed improvements are needed by changing the trunk angle to 0°- 20 with a score of = 2.
 - The position of the neck (neck), the position of turning or bending the neck, is eliminated and gets a score of 1.
 - Fixing the same footstool position, then the foot position will be balanced with a score = 2.

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