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Analysis and Design of Ergonomic Work Posture in Cutting Part in PT EYZ Using Reba Method

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Abstract

Human activity requires a tool that is designed or specifically designed to help work to be easier, safer and more comfortable, the right design can be obtained by applying anthropometry. Workers often experience complaints of pain in some parts of the body because work facilities are not ergonomic. The research objective is to obtain an ergonomic design of work facilities in accordance with anthropometry. Data collection is done by interviews, distributing questionnaires and taking data on the object of research. The results of data collection were tested for uniformity, adequacy, and normality, as well as calculating percentiles that were considered to represent the measured data. SNQ results indicate that workers are in the very painful category in the right upper arm, waist, right ankle, left ankle, left knee, right knee, left calf, right calf, left foot and right foot, which shows the working posture at the cutting station not ergonomic. The assessment of the level of work posture using the REBA method shows a high risk level of 7-9 meaning that workers need immediate improvement in the near future. The average workload with the 42% CVL method is in the category of improvement needed. The proposed work facility design is based on anthropometric principles, namely a work desk measuring 171.75 cm x 78.5 cm x 70.45 cm, a work chair 46.99cm x 31.67 cm x 45.25 cm, a storage box of 50 cm length and width 55 cm and trolley 76.58 cm x 60 cm x 77.07 cm.

Keywords : Work Facilities; Ergonomics; REBA

INTRODUCTION

Humans in activities need a tool designed or specifically designed to help human work to become easier. The right design makes the work feel lighter, more comfortable and faster that can be obtained by applying anthropometric data. Tarwaka (2004) states that work postures are not natural (squatting and bending) resulting in static muscles working. Muscles get a static load for a long time, can cause complaints of pain in the muscles resulting in damage to the joints, ligaments and tendons.

PT XYZ is one of the blacksmith businesses where the product produced is a crowbar. Crowbar is a tool used to mine rocks. The crowbars produced are flat on one side and hooks on the other, measuring 32 cm, 42 cm and 52 cm. Crowbar raw material is iron screw with a size of 60 cm to 200 cm with a diameter of 2 cm. The work system in making crowbar is still manual and some use the help of machines where the process starts from cutting, forming and painting. Observations made on the cutting where the work elements start from the process of taking, preparing, measuring, cutting and laying the iron screw. Cutting using a cutting tool and an iron table as a backrest. The yield of iron screw cut in one day is 350-400 sticks. The working posture in the process of cutting the iron screw is done with the squat condition, the body bent and the legs bent, so that the worker cannot work comfortably. This condition causes the work system of workers to be disrupted because they often experience tingling, aches, and get tired quickly, due to the absence of ergonomic work facilities and the wrong working attitude can lead to the risk of pain complaints. Preliminary research conducted is conducting interviews with workers, where workers feel complaints of pain in the upper arm, back, waist, and legs. Workload is the burden of physical, mental, social activities received by a person that must be completed within a certain time, according to physical abilities, as well as the limitations of workers who receive these burdens. Workload is also a group or a number of activities that must be completed by workers within a certain period. Work must always be endeavored with an ergonomic work attitude (Nurmianto, 1998).

METHODS

The methodology that was used in the assessment of employment is a method of reba posur rapid assessment entire body .The solution of a problem limited to until in the provision of the proposal in accordance with the design of the facility with which ergonomics anthropometry the body workers , does not extend to those making products in a tangible manner .The results of the design of facilities to be held without taking into consideration the cost of getting the implementation of the proposal ergonomics given .Worker who observed working normally and an instrument the measurement of used are in a good condition and work as the function is fit .The production process and procedures work does not undergo a change during the visit .A special purpose this research is to identify complaints pain workers by using standard nordic questionnaire (SNQ) , analyzes posture with members of the house reba method rapid assessment) entire body , identify the workloads workers with the pulse workers doing the calculations , measuring the dimensions of the body (antropometry) as basic work facility design, get an ergonomic work posture proposal with manneQuin Pro software and get an ergonomic working condition. The work measurement results can be used to obtain standard time and standard output that can later be used to do production planning (Sutalaksana dkk, 2006)

The type of research conducted is descriptive research (descriptive) research is research that seeks to describe problem solving to a problem that exists now systematically and factually based on data. So this research includes the process of collecting, presenting and data processing, as well as data analysis and interpretation. (Sinulingga, 2011)

In this study, the research instrument used was the Standard Nordic Questionnaire (SNQ) which was used to identify the initial value of muscle complaints experienced by workers, the Heart Rate is used to determine the workload of workers at the station cutting by counting the pulse of workers, 16.1 Mega Pixel Casio Digital Camera is used to take pictures and record the activities of workers at work stations and the meter is used to measure the length, width and height of work facilities actual and body dimensions of workers.

Complaints that are felt in several parts of the worker's body are affected by the working conditions at the cutting station. Complaints from working conditions Due to the absence of ergonomic work facilities, suggestions are made design of work facilities in accordance with anthropometry. (Wignjosoebroto, 1995)

The data obtained are the results of the REBA analysis, worker anthropometry, workload, and improvement of ergonomic work facilities. The steps for data processing carried out are Standard Nordic Questionnaire (SNQ) to determine which body part experience the risk of worker static muscle fatigue. University of Northern Sumatra, Determination of the dimensions required for the design of work facilities and Design of proposed work facilities in accordance with anthropometric data.

RESULTS AND DISCUSSION

The Standard Nordic Questionnaire (SNQ) is one of the measuring tools commonly used to identify the source of complaints of muscle fatigue. Through the Standard Nordic Questionnaire, it is possible to know the parts of the muscles that are involved experienced complaints with a level of complaints ranging from pain very ill. (Applied Ergonomics, 1987). Standard Nordic Questionnaire (SNQ) was created to find out complaints experienced by workers during the process of cutting screw iron. SNQ data collection is provided to the cutting station workers. Results SNQ data recapitulation can be seen in Table 1.

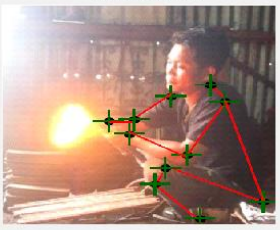
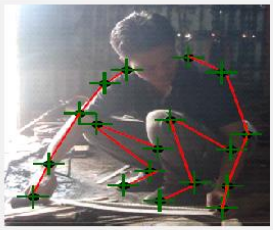
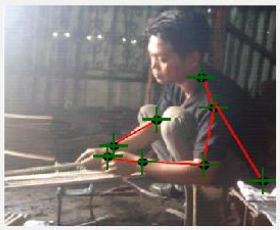
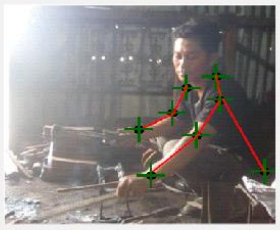
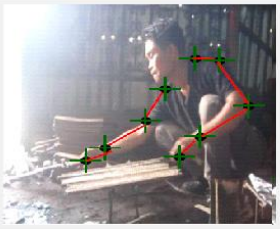
Tabel 1. Standard Nordic Questionnaire (SNQ)

Dimension Number	Grievance Level	Dimension Number	Grievance Level
0	3	14	2
1	3	15	3
2	2	16	2
3	3	17	3
4	2	18	3
5	3	19	3
6	4	20	4
7	4	21	4
8	2	22	4
9	2	23	4
10	2	24	4
11	3	25	4
12	2	26	4
13	3	27	4

Information on body dimension numbers can be seen in appendix 1. Assessment based on the SNQ questionnaire for the weighting of not sick, slightly sick, sick and very sick are 1, 2, 3 and 4.

Problem solving analysis refers to workload analysis with using direct and indirect methods. Analysis of posture actual work. Analysis of the actual facility and the proposed work facility design. Elements of activities carried out by workers are shown in Table 2.

Tabel 2. Worker Activity Element

No.	Activity	Activity Pictures	No.	Activity	Activity Pictures
1	Pick up objects		5	Turn on the Tool	
2	Measuring Objects		6	Cuting Objects	
3	Arrange objects		7	Put objects	
4	Take the tool				

Worker Complaints Based on the SNQ Questionnaire at the Station Cutting. Complaints felt by workers at the cutting station can be seen in the histogram in Figure 1 Worker Complaints Based on the SNQ Questionnaire at the Station Cutting. Complaints felt by workers at the cutting station can be seen in the histogram in Figure 1.

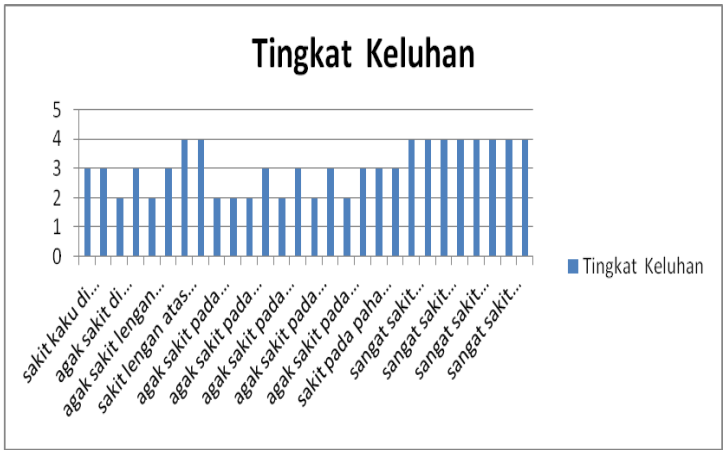


Figure 1. Worker Complaint Histogram

Assessment of working posture with the REBA method on the element taking screwed iron can be seen in Figure 2.

Figure 2. Taking Threaded Iron

The assessment is carried out on the right and left sides of the worker's body on elements take screw iron. Retrieval of screw iron is done by reaching screwed iron by hand in a bent position. Assessment of body parts right and left using the Rapid Entire Body assessment sheet Assessment (REBA) Assessment Worksheet. Assessment is done by Give a score in the box provided. Assessed body part The first is the neck, legs, and body. The scores of the three sections then entered into table A until the value from table A is obtained. The value from table A then added with the load value which will produce an A score. The body parts to be assessed next are the wrists, forearms, and upper arm. The scores from the three sections are then entered into table B until the value from table B is obtained. The value from table B is then added up by the value of the grip that will produce a score of B. The score of A and B then entered into table C to produce table C values. Score value REBA is obtained from the sum of table C values and activity values. Results of The assessment for the work posture in the image above can be seen in Figure.

Tabel 3. Recapitulation of Work Posture Calculation Results

No	Activity	Parts of body	Score	Corrective action
1	Pick up objects	Left	9	Need corrective action as soon as possible
		Right	7	Action required
2	Measuring Objects	Left	7	Action required
		Right	6	Action required
3	Arrange objects	Left	6	Action required
		Right	6	Action required
4	Take the tool	Left	6	Action required
		Right	7	Action required
5	Turn on the Tool	Left	7	Action required
		Right	9	Need corrective action as soon as possible
6	Cuting Objects	Left	6	Action required
		Right	6	Action required
7	Put objects	Left	8	Need corrective action as soon as possible
		Right	7	Action required

Based on the REBA assessment that has been carried out on the body parts, right and left, the REBA score is 9 and 7. It can be concluded that the activity of taking screw iron is at a high risk level so that urgent action is needed. Assessment for work posture for all activity elements can be seen in the attachment image. Recapitulation of work posture calculation results shown in Table 3.

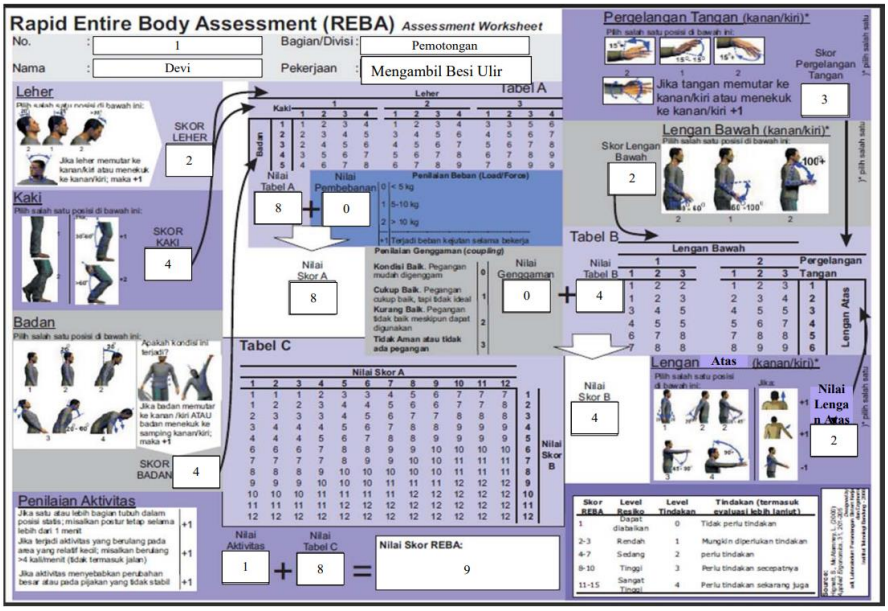


Figure 3. REBA Assessment Sheet Elements of Worker Activities Taking Threaded Iron on the Left Body

Body map assessment with Standard Nordic Quistionnaire (SNQ) shows that workers at cutting stations are dominant with category very ill. The very sick category is found in several parts of the body, namely: right upper arm, waist, right ankle, left ankle, knee left, right knee, left calf, right calf, left foot and right foot due to workers in the process of cutting in a bent body condition, legs bend and squat so that it makes some parts of the body feel aches and pains.

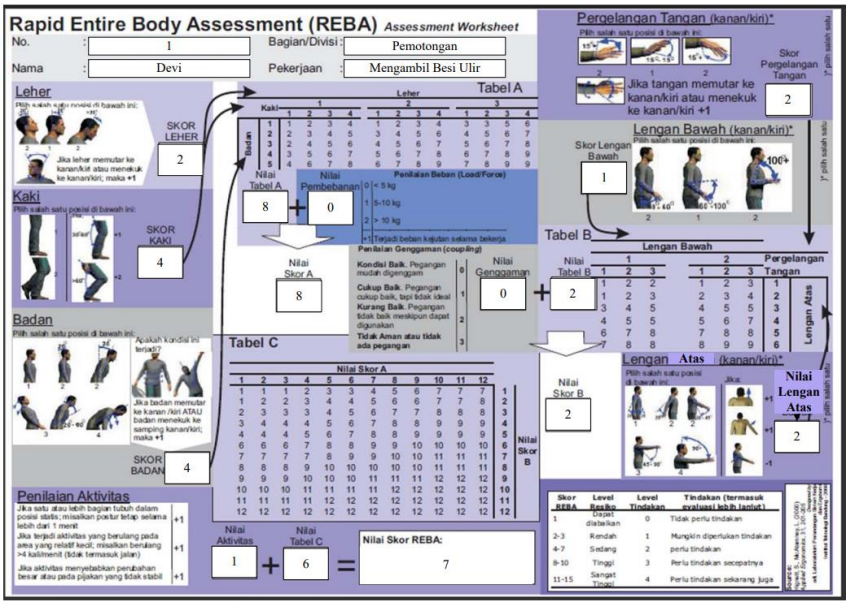


Figure 4. REBA Assessment Sheet Elements of Worker Activities Taking Threaded Iron on the Right Body

The working posture at the cutting station starts from picking up, measuring, arrange, turn on the cutting tool, cut, put the screw iron. Then the pile of screwed iron is brought by workers to the next station by manually using hands with heavy loads. Actual movement elements Most of the workers at the cutting station are carried out with different work postures not ergonomic. The assessment carried out by the REBA method is known that the biggest element is the movement of taking the screw because it is deep the process of taking workers must move in a squat position with a distance of half to one meter from the cutting station. REBA assessment of the process University of Northern Sumatra The removal of screw iron is categorized as requiring immediate corrective action. This matter because the worker takes the screw in a bent position to form a angle is greater than 45 degrees.

CONCLUSION

The conclusions obtained from the results of data processing and analysis of the discussion are the results of processing the level of complaints experienced by workers during the process of cutting iron screw with the distribution of the SNQ questionnaire obtained that the body parts that are very sick are the right upper arm, waist, right ankle, ankle left foot, left knee, right knee, left calf, right calf, left foot and right foot, this is due to the absence of work facilities so that workers work in a state of squatting, bending, and bent legs. The work posture assessment results show that cutting activities have a level 5-7 risk with a category of need for action and a level of risk 8-9 needs immediate remedial action. Workload based on the value of energy consumption for workers is 351Kcal / hour-379Kcal / hour are in the weight category, with the cardiovascularload (CVL) method is 35-39 obtained results that require improvement. Corrective action taken is designing worker facilities, namely a work table that is useful as a place in the process of cutting and a work chair as a worker seat so that workers work comfortably and ergonomically. . The work posture assessment of Mannequin Pro software is obtained a score of 2-4 where the category of workers is safe. The working conditions at the cutting station have changed due to the design of the work facilities so that workers work more ergonomically.

REFERENCES

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sorensen, F., Andersson G.,Jorgensen, K. 1987. Standardised Nordic Questionnaores (Applied Ergonomics)

Nurmianto, Eko. 2008. Ergonomi Konsep Dasar dan Aplikasinya. Surabaya: Guna Widya

Sinulingga, Sukaria. 2011. Metodologi Penelitian. Medan: USU Press.

Sutalaksana,I, dkk. 2006. Teknik Tata Cara Kerja. Bandung : Institut Teknologi Bandung.

Stanton, Naville. 2005. Handbook of Human Factors and Ergonomics Methods, (New York: CRC Press LLC,)

Tarwaka, dkk. 2004. Ergonomi Untuk Keselamatan, Kesehatan Kerja dan produktivitas. UNIBAS Press. Surakarta.

Wignjosoebroto, Sritomo. 1995. Ergonomi Studi Gerakan dan Waktu. Surabaya : PT. Guna Widya.