

INVESTIGATION OF ERGONOMICS PROBLEM AT PT X.

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ABSTRACT

PT X is one of company concern in manufacturing process, especially in making pulleys with sand casting processes. The process start from make a sand casting, four the molten metal to dies and finally cleaning the product output. The company realize that the output not maximal yet. Short investigation show there are some problems like an sufficient work station, bad facility layout, longer time cycle and operator complains. More accurate investigation using nordic bodimap questionnaire, work perception questionnaire and work duration measurement show there are musculoskeletal problem, longer work time cycle caused by several an necessary motion at work.

Keywords: *questionnaire, work and musculoskeletal problems*

1. INTRODUCTION

PT. X is one of company which concern in metal processing manufacturer industry, especially in producing of molen machine component with metal molding process. The product are pulleys. General processes started with making mold from sand called sand casting by using sand vibrator machine, pours liquid metal into sand casting, open sand casting and the last cleans product outcome.

Based on brief observation on field visit, it can be predicted that the arrangement of workplace is not good yet, the workers cannot work optimally, position of worker only stand up and less ergonomic work bench. Poor arrangement of workplace generate another problem. The worker feel

fatigue earlier, longer time required to make a mold compared to normal condition, useless movement and motion of worker when make a sand casting.

To assure the field conditions, hence hardly need to conduct research more circumstantially to know complain and problem happened. For the purpose, all operator is given questionnaire Nordic Body Map and questionnaire perception of worker, to know the condition experienced by operators. Result of this investigation later would very useful to improve, redesign job and work station to obtain safety, efficiently and effectively of work.

2. ERGONOMICS

Ergonomic came from Greek that is word " ergon" is meaning job or activity and " nomos" is meaning natural law. Thereby Ergonomic is study about human aspect in the work environment. Concern of ergonomic are anatomy, physiology, psychology, engineering, management and design. Ergonomic discipline science approach is aimed to improve human activity performance like accuracy, working safety, longer time of fatigue coming, improve utilization of human resource and minimization of equipments damage caused by man error.

Ergonomic is technological science and art to ensure the compatible of equipment and work environment to the ability and man constrain to achieve healthy work environment, safety, efficiency an productivity.

Ergonomic aim is to increase prosperity of physical and bounces, especially for preventing disorder and disease as result of activity, reduces work load and promotes job satisfaction. Improve quality of social contact, how organize the activity as well as possible. Increases efficiency of man-machine system, technical aspects, economics, anthropological and culture.

3. MUSCULOSKELETAL PROBLEMS

Musculoskeletal systems, bones, soft skin tissue and metabolism needed to provides energy requirement for systems muskuloskeletal. Muscles are the one of main element in human activity. Among many muscle types, skeletal muscle(Voluntary) becoming attention to all ergonom. Group of skeletal muscle to be on the neck, back, chest foot/feet, shoulder, brachium, forearm, calf, bottom, thigh. Muscles produce pressure can be maximum in a state of stretching

and a muscle contraction can apply small pressure. A muscle produce mechanical work by changing chemical energy to mechanical energy. (Bridger,1995; Kroemer, 1992).

Problems at system musculoskeletal well know as Musculoskeletal Dis Order(MSD) influenced by existence of not normally working of muscle, working posture. It can generate fatigue of muscle and un comfortable taste. These caused by pressure at the soft skin tissue and restrict the blood circulation. The condition effecting the lessen of oxygen, carbon dioxide and lactic acid as a waste can not discharge from the muscle. Lactic acid gives stiff sensation, weary until pain taste. Decomposition of lactic acid requires time and happened at the muscle time relaxation. This is the reason why the muscle needs rest to give time change the lactic acid. Some factor which cause the problem of skeletal muscle that is stretching or over exertion in general often happened at job which need big energy like lifting, pushing activity of weight product. Stretching of abundant muscle beyond optimum strength of muscle often produce the risk of muscle like injuri on skeletal muscle.

4. METODOLOGY

To know the field condition we need to gather the data. Data obtained from questionnaire given to 6 people responder who are the operator at sand molding workstation. Questionnaire given in the form of nordic body map questionnaire and perception questionnaire about work, equipment and situation of workstation.

5. DATA AND ANALISYS.

Data presented in following table and thick capital mean needs further attention.

Table 4.1. Nordic Body Map Data Before And After Work.

No	Problems	Yes answer		Calculations	
		Before	After	Total	Percentage
0	Sick at upper neck	0	1	1	16.67
1	Sick at under carriage neck	0	2	2	33.33
2	Sick at left shoulder	0	0	0	0
3	Sick at right shoulder	0	0	0	0
4	Sick at left part brachium	0	0	0	0
5	Sick at left part brachium	0	6	6	100
6	Sick at part of back	0	0	0	0
7	Sick at starboard brachium	0	6	6	100
8	Sick at waist rear	0	6	6	100
9	Sick at bottom	0	0	0	0
10	Sick at left elbow	0	0	0	0
11	Sick at right elbow	0	0	0	0
12	Sick at left part forearm	0	0	0	0
13	Sick at starboard forearm	0	0	0	0
14	Sick at left wrist	0	0	0	0
15	Sick at right wrist	0	0	0	0
16	Sick at left palm	0	0	0	0
17	Sick at right palm	0	0	0	0
18	Sick at left thigh	0	1	1	16.67
19	Sick at right thigh	0	2	2	33.33
20	Sick at left knee	0	0	0	0
21	Sick at right knee	0	0	0	0
22	Sick at left calf	0	4	4	66.67
23	Sick at right calf	0	4	4	66.67
24	Sick at left ankle	0	1	1	16.67
25	Sick at right ankle	0	0	0	0
26	Sick at left foot/feet palm	0	0	0	0
27	Sick at right foot/feet palm	0	0	0	0

Table 4.2. Perception Data About Work, Equipment And Condition Of Workstation

No	Questions	Answer	
		Yes	No
1	Does you feel comfort with the existing working condition ?	0	6
2	Does you feel difficulty with the existing working condition ?	5	1
3	Is position of sand box fit to the position of ideal activity?	2	4
4	Is the position of work the bench have been good?	5	1
5	Does you feel difficulty in taking sand molding equipments?	0	6
6	Does enables at the time of working, you works for position to sit?	0	6
7	Does the position and posture make operator comfort?	4	2
8	Does the position of resin sand casting fit to the operator?	0	6
9	Doses the position of the compressor hose fit to the operator ?	0	6
10	Does illumination of condition of workstation have been according?	6	0
11	Does the position of mold frame and other equipment have been good?	6	0
12	Does the workers need chair to take a rest after some times of work?	0	6
13	Does the vibrator machine distance with work bench and sand sufficient?	6	0
14	Does the position of sand casting have been good?	6	0

Table 4.3. Suggestions Data Given By Operator

Question No	Suggestions
3	Higher sand container needed.
6	Not possible to work in sitting position at the sand vibrator.
8	Make specials place to put equipment so that not necessarily looking motion and awkward posture.
9	Install compressor hose handle in order to make easy to reach it.

Table 4.4. Suggestions Data Given Based On Part Of Body Complain.

Body complain	Suggestions
Sick at top neck	Replace mold core and sand container made more height.
Sick at part of back	Replace mold core and sand container made more height.
Sick at right and left thigh	Manage the time of working and resting.
Sick at left calf and right calf	Replacing mold core and rearrange the position of work bench and sand container.

Table 4.5. Suggestion Given Based On Question Of Perception Questionnaire.

Questions	Suggestions
Does you feel comfort with existing working condition ?	Replacing mold core and sand container must be more height.
Do you feel difficulty with the existing workstation ?	
Does the position of sand container fit to the job and operator?	Sand container must be more height.
Does it enable to change work posture from standing to sitting?	It is possible to change standing work posture to mixed posture (sitting and standing)
Does the position of sand casting fit to the good layout?	Replacing mold core and rearrange the position of work bench and sand container.
Does the position of compressor hose good?	Install compressor hose handle in order to make easy to reach it.
Do the worker need chair to take a rest ?	Worker not necessary chair to take a rest. .

Base on field observation, it is known that the workers when doing work apply disadvantage motion and an ergonomic posture. Disadvantage motions are search motion for compressor hose continued with bows motion to take it. Bows motion when taking sand from sandbox causes by placement of sandbox too low. Sand compression activity with stand posture causes trouble at shoulder and calf. Search motion and bows posture when taking mold core. Some motions and posture are not ergonomic causes some complain and sick at organ.

The motion and an ergonomic situation can be changed or eliminated by change parts of an ergonomic workstation, changes layout of material and equipment and improve work the bench

and sandbox dimensions. These change will affects the production process, motions and saving the time of work.

6. CONCLUSION

Based on the result analysis, the conclusion as follow:

- a. From nordic body map questionnaires known that the existing workstation and method applied still generate complain. Complains happened at back, hip, calf and neck. It caused by an natural motion in unergonomic work station.
- b. From perception questionnaires known there are any useless motion like motion look for compressor hose , movement look for mold core, etc

6. REFERENCES

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