

A Qualitative Research of the Use of Personal Protective Equipment on the Workers of Metal Manufacturing Industry

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Abstract—Basic metal industry is one of priority industries which includes in upstream industry. The principles of occupational health and safety have to be applied to achieve the optimal productivity. The management of potential hazard and risks needs to be conducted like the use of Personal Protective Equipment (PPE) to the workers. This research aims to find out the influencing factors on the use of PPE to the workers of metal manufacturing industry. The research used a qualitative research with a case study design. The data collection was performed by deep interviewing both main and second informants. The data analysis used in this research was interactive data analysis. The research validity applied source and data/analysis triangulation. The research results showed that there were occupational hazard like danger of heat, electricity, sparks, iron powder, iron shavings, and noise; while the workers knowledge of PPE were PPE could reduce risk, avoid work accident, protect the workers, keep their health and safety. Some PPEs used by the workers were glasses, mask, hand protectors, chest protectors, hand gloves and ear plug. To sum up, the knowledge related to occupational hazard and PPE could have some effects on the use of PPE to the workers of metal manufacturing industry.

Keyword: personal protective equipment; occupational hazard; electrical hazard; occupational health and safety, metal manufacture

1. INTRODUCTION

According to National Industrial Development Master Plan 2015 – 2035, basic metal industry and non-metallic minerals are one of the priority industry which includes in upstream industry. Upstream industry is a basic manufacture industry producing raw materials that are used in downstream industry. One of the national industrial development targets is improving the competent workers in the industry field, and the government is very committed to reach the target (Ministry of Industry, 2015).

The competent workers are the main modal to increase the productivity at work. The principles of occupational health and safety are some efforts which have to be performed to create the optimal productivity at work. The potential of occupational hazard is in all industry sectors even in metal manufacturing industry. The workers have to manage each potential hazard in the workplace, because the hazard can cause work accident or occupational illness which can obstruct the realization of optimal productivity at work. The management of potential hazard done by the workers is by using Personal Protective Equipment (PPE).

The use of PPE relates to many aspects, not only as the prevention of occupational illness but also as the obligation in accordance with the law. Moreover, the use of PPE is one of the efforts to increase work safety performance. The obligation to use PPE is not only for the workers, but also for the head of the company, field supervisor, supervisor, and even for those who enter the workplace (Tarwaka, 2014).

Working in the metal manufacture has big risks, both work accident and occupational

illness. The use of PPE while working is one of the ways which can be performed to manage those risks. Nevertheless, the awareness to have discipline in using PPE is not belonged to the workers yet; there are some of them who do not use PPE while working. It is in line with the research finding on the metal manufacturing company that produces heavy equipment components. Based on the result of the researcher’s observation, there are some workers who use PPE and some of them do not use it. The recommendation on using PPE exists in the workplace, and also written in the company regulation. Yet, there are still workers who do not obey the rule.

Informants Order	Age (year)	Sex	Education	Division	Years of Service (year)
Informant 1	40	Male	Junior High School	Welding	10
Informant 2	40	Male	Senior High School	Welding	7
Informant 3	31	Male	Vocational High School	Grinding	1
Informant 4	25	Male	Vocational High School	Drilling	4
Informant 5	40	Male	Senior High School	Management	25

The importance of using PPE and the result of the previous study about the practical difference of the use of PPE on the manufacture company are the reasons why the researchers are interested in conducting this research entitled “A Qualitative Research of the Use of Personal Protective Equipment on the Workers of Metal Manufacturing Industry”. The research aims to find out the factors effecting on the use of PPE to the workers of metal manufacturing industry. The uniqueness of the research is in the qualitative method on discussing the use of PPE to the workers of metal manufacture, because the similar studies had mostly conducted in quantitative method. Therefore, the researchers would like to study concerning the use of PPE by applying qualitative method. Thus, it can enrich the existing knowledge.

2. MATERIALS AND METHOD

This research was conducted in February to May 2018 on the metal manufacturing industry producing heavy equipment components in Tegal regency, Central Java. The research used a qualitative research design with deep interviewing as the data collection technique. Through qualitative method, the researchers in deep way could find out the factors affecting the metal manufacturing workers in the use of PPE which was in personal value. Therefore, the research applied a case study design.

The data was collected by main and second informants through deep interview with interview guideline as the instrument. The main informants in this research were metal manufacturing workers: 2 persons who worked in the welding division, 1 person in grinding division, and 1 person in drilling division. The researchers chose those divisions based on the risk level; welding division had the highest risk level of other divisions, so that the researchers took 2 main informants from the division. For grinding and drilling division, there was 1 main informant in each because the risk level and its hazard were in moderate and low category. For the second/supporting informants, the reserachers used 1 person from part of company management. Both main and second/supporting informants were chosen by using purposive technique.

Deep interview was conducted by using interview guideline which had been prepared. The research instruments were the researchers as the main researchers, interview guideline, and voice recorder. Each informant was interviewed twice. Each interview was documented by using voice recorder; then the data were changed into transcript form, so that it made

easy to analysis the data with Open Code 4.03. The collected data were analyzed by using interactive data analysis including data reduction, data display, and conclusion drawing/verification. The data validity used source and data/analysis triangulation. Source triangulation was re-checking obtained information through other factual sources processed by different informants. The data/analysis triangulation was re-checking the informants responses by re-asking the meaning of their answers to verify the correctness of their answers, thus there were twice in conducting deep interview with the informants.

Informants Order	Age (year)	Sex	Education	Division	Years of Service (year)
Informant 1	40	Male	Junior High School	Welding	10
Informant 2	40	Male	Senior High School	Welding	7
Informant 3	31	Male	Vocational School	High Grinding	1
Informant 4	25	Male	Vocational School	High Drilling	4
Informant 5	40	Male	Senior High School	Management	25

Table 2. The Description of Knowledge Workers on Occupational Hazards

No.	Occupational Hazards	Knowledge Informants	Informants' Expressions
1.	Danger of heat	According to the informants, heat was potential hazard faced by the workers.	"...when we are getting welding, it's so hot ..." (Informant 1) "...the negative thing in the welding division it's related to heat." (Informant 2)
2.	Danger of electricity	According to the informant, electricity danger existed because of voltage on the machines.	"Eee..if it's electricity it means the machines..." (Informant 2)
3.	Danger of sparks	According to the informant, danger of sparks came from grind machine while grinding and it was almost going to the eyes.	"...sparks comes from the grind; sometimes it goes to the eyes."(Informant 3).
4.	Danger of iron shaving	According to the informant, iron shaving from the result of drilling can be potential hazard to the workers, namely the workers hand was twisted due to the iron shaving.	"...twisting on this hand gloves..." (Informant 4).
5.	Noise	According to the informant, the voice of grind machine was noise source.	"Machine voices.... Especially grind machine." (Informant 3).

The effect of heat faced by the workers of metal manufacturing industry especially the workers who were in welding division. The existing of the heat needed a control treatment because heat exposure could cause illness and death. The serious illness was heat stroke. Furthermore, heat exposure faced by the workers could make a rash, fatigue, and cramps; those needed to be controlled (Occupational safety and Health Administration, 2017). Some risk factors causing illness due to heat exposure at the workplace were heavy physical labor and insufficient fresh air in the workplace environment (Occupational safety and Health Administration, 2014).

Welding and grinding equipment used in the research place was electric welding. Thus, based on the informants' answers, the use of electric welding was a hazard like danger of electric shock. Electric shock can make serious burns, even death (Safe Work Australia, 2012). Generally, welding uses low voltage but electrical hazard to welding workers and others can be a big problem if the workplace is in a wet condition and narrow workspace (AFSCME, 2012).

Sparks resulted on the welding process could make fire if there are some flammable things around it (AFSCME, 2012). Iron powder and sparks were one of the hazards in their workplace. Iron shaving can also be hazard because it can hurt body's workers like hand, foot, and other parts of the body.

Based on the research result, informants' knowledge about occupational hazard was very good; they were able to identify the existing hazard in accordance with the types of work. The occupational hazard stated by the informants was not only conveying fatal hazard or causing a big loss, but also identifying hazards which had lower loss.

Tabel 3. The Description of the Use of PPE on the Workers

No.	Knowledge of PPE	Informants knowledge	Informants Expressions
1.	PPE reduces work risk	According to the informants, if they did not use PPE, it will increase risk of accidents to the workers.	"Alright, if we don't use PPE, it's just an example, we got work accident" (Informant 1) "Yes, we'll be avoided by the risk" (Informant 3)
2.	PPE prevents occupational accidents	According to the informant, PPE can decrease risk of work accident and avoid the loss due to the work.	"Eee.... At least, it can decrease work accident..." we get loss if there is work accident...(Informant 1).
3.	PPE can protect the workers	According to the informants, the use of PPE can give protection while working.	"PPE can keep us while working" (informants 4). Well, that's protective safety" (Informant 3)
4.	PPE keep health and safety of the workers	According to the informants, occupational health and safety can be kept by using PPE while working.	"... if it's for safety, PPE should be used." (Informant 2) "... The main thing is something for keeping our health..." (Informant 5)

Personal Protective Equipment (PPE) is designed to keep of serious injury or illness due to chemicals, radiology, physic, electricity, mechanic or other hazards. The selection of PPE

should be conducted carefully and the use of PPE should be suitable, so that the existing of PPE can keep the workers even in emergency situation. There is no one type of PPE which is able to protect all hazards PPE was very good, because they were able to identify that the use of PPE was not only keep the workers, but also reduce risks of workplace accidents, prevent occupational accident, keep health and safety of the workers.

No.	The use of PPE	Informants knowledge	Informants Expressions
1.	Glasses	According to the informants, glasses and some PPEs were used by the workers.	“Yes, there are glasses, mask, and earplug”(Informant 3) “Mask, glasses” (Informant 2)
2.	Mask	According to the informants, mask and some PPEs were used by the workers.	“There are mask, helmet, apron, those are to....(Informant 5) “Like mask, arm and chest protection” (Informant 2)
3.	Arm protection	According to the informants, arm protection and some PPEs were used by the workers. Especially in welding division, arm protection was leather hand gloves.	“Apron and others like apron, helmet and arm protection(Informant 5) “...those are leather hand gloves and arm protection (Informant 1).
4.	Chest protection	According to the informants, chest protection and some PPEs were used by the workers.	“It’s used for a..chest protection ehm(coughing)” (Informant 5) “Eeee... here, PPE is chest protection...” (Informant 2)
5.	Hand gloves	According to the informants, hand gloves and some PPEs were used by the workers. Especially in welding division, hand gloves used was leather hand gloves.	”...hand gloves, safety shoes, mask and helmet.”(Informant 4) “Leather hand gloves in welding... (Informant 2)
6.	Earplug	Menurut inform Menurut to the informants, earplug and some PPEs were used by the workers. Earplug was used for keeping the workers’ hearing.	“...there are mask, helmet, apron, and earplug for keeping our ears”(Informant 5) B : “Earplug, hand gloves and mask”(Informant 3)

Personal Protective Equipment (PPE) used by the informants can be categorized into 4 parts: respiratory protection, eye protection, hearing protection, hand and chest protection. Based on the ways of working, respiratory protection can be covered by two ways: removing contaminant from the air and providing fresh air which can be inhaled by other sources. Removing contaminant from the air include particulate respirator which filter particles in the air and the gas mask aim to filter chemicals and gas (Centers of Disease Control and Prevention, 2018). The informants in the research used particulate respirator to protect their respiration. The eye protection was adapted to the characteristic, hazard level and the workers' sight (Centers of Disease Control and Prevention, 2013).

Safety glasses should be used when there is occupational hazard on the eyes and face. Eye and face protection are protective equipments to keep the eyes and face from dangerous chemicals exposure, particles exposure floating in the air and the body of water, sprinkling small objects, heat or hot steam, ionizing and nonionizing electromagnetic wave radiation, light beam, and impact of hard or sharp objects. The types of hearing protection consist of ear plug and ear muff. The respiratory protections are protective equipments that function to protect respiratory organs by distributing clean and healthy air and / or filtering chemical contaminants, microorganisms, particles in the form of dust, aerosol, steam, gas/fume, and so on. Hand protection (hand gloves) is protective equipment to keep hand and fingers from fire exposure, hot temperature, cold temperature, electromagnetic radiation, ionizing radiation, electric current, chemicals, clash, scratches, infected with pathogenic substances (virus, bacteria) and microorganisms (Ministry of Manpower and Transmigration of the Republic of Indonesia, 2010).

Conclusion

Based on the research result, knowledge informants about PPE was good. The use of PPE had diversity. It depends on types of work and occupational hazard which the workers faced. The use of PPE was affected by occupational hazard and knowledge informants on the use of PPE

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