Workplace Accident Investigation of Finger Drops in Metal Manufacturing Industry Workers

1st Erna Agustin Sukmandari
STIKes Bhakti Mandala Husada Slawi
Tegal, Indonesia
erna2113@gmail.com

2nd Anggit Pratiwi
STIKes Bhakti Mandala Husada Slawi
Tegal, Indonesia

***Abstract*— Metal manufacturing industry is one industry that has a high risk for work accidents, both minor accidents, moderate, or severe accidents. Potential hazards that must be minimized so that workers can protect their safety and health. One way that can be used to overcome the danger is to use personal protective equipment (PPE). This study aims to analyze the work accidents that are removed by workers' fingers. Research using qualitative methods with case studies on workers who have work accidents. The main informants are workers who repair work accidents, while supporting informants are HSE managers in the industry. Data obtained through interviews conducted with key informants and supporting informants. Based on research data that can be done by workers who are disconnected in the finger segment due to being twisted by the threads that have been wasted from the gloves they use. At that time, the informant was looking for workpieces using a rotating machine. The informant is not aware of the thread being unraveled and takes machine turns so that it wraps around the fingers. The informant only knows that the finger was finished after finishing and took off the gloves. Inappropriate use of PPE will oppose workers. In addition, workers do not need work safety instructions, thus increasing the risk of workplace accidents.**

Keywords—accident, personal protective equipment, injury, health and safety, broken finger

I. INTRODUCTION

The metal manufacturing industry is one of the industries that have a high risk of having work accidents, both minor, moderate and severe accidents. The high risk of accidents is due to the many potential hazards, so the chances of work accidents are increasing. There are various kinds of dangers found in the metal manufacturing industry. 8) Research conducted in a metal industry shows that there are 116 types of hazards that can be identified, including mechanical hazards, electrical, fire and explosion, heat disorders, radiation, noise, vibration, dust, chemicals and toxic substances, biological, ergonomical , and psychosocial. Among these hazards, mechanical hazards are the most common hazards that reach up to 40, 52% or almost half of all types of hazards that exist. 9) Whereas other research states that there are several other potential dangers to metal manufacturing industry workers, namely hazards arising from smoke, light, falling objects, and hazards from iron filings, as well as dangers due to unsafe act.

Work accidents cause many losses both materially and morally which will have an impact on the workers themselves, the worker's family, and on the company. Therefore, preventive measures are needed so that accidents can be minimized or can even achieve zero accidents. Precautions against work accidents have been carried out through controlling potential hazards known as hierarchy control. However, it is still very rarely done by investigating work accidents as part of the steps in taking action to prevent work accidents. Through work accident investigations we can do an analysis of what, who, when, where, why, and how the accident occurred and we can take lessons from the accident to be able to take precautionary measures so that it does not recur. There needs to be an in-depth study of work accident investigations. Therefore, this study tries to provide a discussion about the investigation of workplace accidents that result in finger breaking in machining workers in the metal manufacturing industry by using a qualitative research approach.

II. METHOD

This research was carried out in a metal manufacturing industry that produces water irrigation equipment. The study was conducted through qualitative methods in order to explore in depth how and why work accidents occur. The approach used in this research is a case study approach where the main informant is the worker who had an accident while the supporting informant is from the HSE officer. The main informant is the lathe operator. The main job of the informant as a lathe operator is to make the materials needed for the complete production of goods such as spare parts or sluice accessories. The selection of informants is done through purposive sampling. The informant was chosen because he had experienced a work accident that caused permanent deformity to his finger, namely the break of the segment of the right index finger. The informant is male, 58 years old, and has worked for 28 years. Data is collected through in-depth interviews by expressing a number of questions submitted to key informants and supporting informants that have been prepared in the interview guidelines. Data was collected through a prolonged time method by conducting two interviews at each research informant. The results of in-depth interviews were recorded using a voice recorder, then the results of the recording were transcribed to the data for data analysis. Data analysis was performed using an interactive model that included data collection, data reduction, data display, and conclusions. The validity of the data in this study uses the source triangulation method, by confirming the data obtained from the main informants and supporting informants.

III. RESULT

A work accident that resulted in a break of the right index finger segment at one of the metal manufacturing industry workers that occurred in 2016 at around 08.30. The accident occurred when the main informant would do the finishing by smoothing the workpiece using sandpaper.

"Finishing, finishing my work, using (using) sandpaper, using (using) my sandpaper, grasping the machine, I mean I mean it's like this," (while demonstrating a rotating object)

The work has often been carried out by key informants as stated as follows:

: "Now I hold this, I have sandpaper hands, I usually do it ..."

Before starting the machine, the main informant first also uses personal protective equipment in the form of cotton gloves, as stated as follows:

: "Carrying out, starting the engine and I have prepared even though what I have been wearing, protective equipment ... PPE gloves."

However, at the time of the accident, it turns out that there is a thread from the informant's glove that is unraveled, so that the thread continues to be interested in following the engine speed as told by the main informant as follows:

"Well" kreb "knows in this glove, there are threads (pause for a moment) that are colorless." spin, this thing. And finally it turns out that in the palace (in) the gloves there is also a thin thread (thread is broken down) which eventually gets twisted.

3) Machinery and moving equipment have potential hazards which could injure the machine operator. One of the mechanical hazards that can arise is the ability of the machine to pull objects around it that can cause entanglement. Based on this description, we can know that the informant is not yet well aware of the existence of mechanical hazards in the machines he operates.

Finally, the twisted thread twisted around the main informant's finger segment, and when the informant opened his glove it turned out that the finger segment had been cut off, as stated by the main informant as follows:

"To this engine rotation, finally this inside (tug) inside finally pulls what is wrapped around ..." this wrapped around this segment so this and sa finally ... on my broken finger reflex by pulling my "des" I come out already in broken state. "

According to the informant, the break of the finger segment was not because it was pinched or formed, but because it was entangled with threads that had been wasted from his gloves:

"So it is not because it is tarred or bumped, or it is not from, because it is twisted with thread, which is in my glove, that ..."

"And the thread came out and then outside ... dancing, being attracted to the engine rotation ... Finally it was wrapped around and finally it was cut off in my fingers ..."

4) The selection of personal protective equipment must be based on job hazard analysis (JHA) which is carried out by evaluating the hazards, the specificity of the work and work procedures. It is very important that we identify all the potential hazards and make the proper selection of personal protective equipment.

The need to use the right equipment can be used as a means of controlling mechanical hazard. 3) Separation of hazards using barriers is mechanical hazard control using simple and effective equipment using distances, barriers, or time. However, if it is not appropriate to use assistive equipment it can be the cause of work accidents, as stated by the informant that the size of the glove is greater than the size of the sandpaper holder, so that the possibility of gloves for direct contact with engine speed becomes larger, which in the end it results in the loose thread of the main informant's gloves, as conveyed by the main informant as follows:

"The sandpaper whose sandpaper workpiece is held directly by hand ... It's as if the workpiece is rotating while the width of the sandpaper is the same as the width of the handle is wider so ... the workpiece is wrapped around and eventually it will be wrapped around it (while pointing the finger joint) so what if, if we just thread it if the diputer like this is the pull right huh the pull is hard (strong).

4) Hazard control through engineering and administrative control is the best way to protect workers. Engineering is done by isolating workers from danger, while administrative controls by changing work procedures. Personal protective equipment is also one way to control hazards, but personal protective equipment is considered less effective in controlling hazards. Personal protective equipment provides a barrier between workers and potential hazard exposures, but care must be taken in selecting appropriate personal protective equipment and its use and care. 10) Personal protective equipment cannot be fully relied upon to protect workers from potential hazards, but we can do so by implementing safer work procedures, reducing hazardous materials or processes, implementing technical controls to reduce or eliminate hazards.

The main informant as a lathe operator must be able to control mechanical hazard. 3) The way that can be taken to carry out risk management on mechanical hazards is through control that comes directly from the source and prevents contact or access to these hazards.

As in the case of the main informant, the company can implement safer work procedures and use appropriate tools to control potential hazards. . 11) Risk management is a process that must be carried out proactively and continuously.2) The precautionary principle in the management of occupational safety and health is to replace everything that can be dangerous with those that are not or less dangerous 6) The potential for work accidents will be greater because of work procedures inappropriate, unsafe behavior, neglect, poor management commitment, and lack of safety knowledge and training for workers. Most work accidents occur because of unsafe behavior and unsafe conditions. 5) Unsafe conditions are generally associated

with workplace management. This can be avoided by following all necessary safety regulations and standards, making workers comply with safe practices, providing an environment of protection for all workers, maintaining safety machinery and equipment and, most importantly, providing a safe and secure work environment where workers feel safe and happy.

The main informant realized that when working we should prepare everything well, including if we are going to use personal protective equipment, then we must examine carefully the feasibility of the PPE, as stated below:

"Yes indeed sometimes if we lack control like that (like that), if we want to use (use) gloves it should be inside (inside) really (really) in a safe condition, there's no thread right which is not safe, it's not, what term (what term) is not in ... mlolor (unraveled thread) which also contains mlolor (unraveled thread). "

10) Inspection of personal protective equipment is mandatory as an effort to control hazards before the work begins. Some things to consider in pre-activity safety plan efforts are environmental conditions, equipment and equipment used, potential hazards and control.

Accidents are never expected or expected to occur, let alone the main informant doing the tasks that he is accustomed to do, as the informant said as follows:

So the chronology is unexpected if that happens. When I want to finish my usual work, that's if (if) I want it ... this means work, easy work mom, yeah easy (concise), it's easy, you don't know ... That's what I know, I know, I'm interesting Puter, I dance and even if my hands are released, what is that knowing ... what hand ... is there pain, cold ceees .... "Iz! ... daning jarine break? (you know! why the finger broke) then the verdict fell straight ... "(the cut of the finger segment immediately fell) underneath ..."

Based on the statement delivered by supporting informants, it can be seen that the work accident at the industry is due to the presence of unsafe act, as follows:

".... That, ma'am, human behavior, that unsafe behavior is causing, then later from unsafe act, it causes from unsafe condition that becomes unsafe condition ..."

6) Apart from unsafe conditions, risky types of work, unsafe equipment, apparently unsafe behavior is considered as a major contributor to work accidents. 1) As many as 42% of workers commit unsafe acts due to lack of confidence, negligence, and mistakes in using personal protective equipment, as well as non-compliance with safety principles. 5) Unsafe act related to the way a person does his job. Unsafe behavior can be prevented by equipping workers with safety knowledge and skills for safety and hazard management.

IV. CONCLUSION

A work accident that caused a finger break in metal manufacturing industry workers occurred at 08.30 in 2016, which was experienced by a key male informant, aged 53 years who had worked as a machine operator for 28 years. The accident happened in a workshop of a metal manufacturing industry. Accidents occur when the main informant operates the machine to smooth the workpiece. When operating the machine, the main informant uses gloves as personal protective equipment. It turned out that the thread on the main informant's gloves was unraveled and continued to be attracted by a very fast machine rotation, so that the thread actually wrapped around the finger and made the finger cut off. The main cause of accidents is due to the unsafe act.

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