

# Analysis of the Factors Causing Occupational Accidents at UPT Balai Yasa PT KAI (Persero) Yogyakarta

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## ABSTRACT

**Background :** UPT Balai Yasa Yogyakarta is a subsidiary of Kereta Api Indonesia (Persero) which engaged in infrastructure facilities units and a locomotive repair workshop that operates only on the island of Java and is the general workshop that maintain steam locomotives, passenger and freight cars. To anticipate increasing occupational accidents in production workers, in need of research to determine the factors that influence the occurrence of occupational accidents in UPT Balai Yasa Yogyakarta. The factors that cause workplace accidents will be investigated views of human factors and environmental factors. **Methods:** The study was a descriptive study with a qualitative approach. The subjects in this study were production workers who had experienced workplace accidents by 17 people. The tool used was in the form of an interview guide, observation, and documents. **Results:** (1) Human factors; many workplace accidents happen due to lack of understanding of workers, less skilled, less education, physical disability, body position while working less comfortable, not orderly use of PPA, sensitivity of the senses and work beyond working hours resulting in fatigue, and productivity employment declined. (2) Environmental factors; the workplace is adequate production conditions in the building but not entirely safe for workers, workplace accidents occur because the tools used are too old, unbelievably disturbing noise threshold, there is a fire in the workplace, and the nature of the work does contain potential hazard. **Conclusion:** Human factors such as labor imbalance (body postures, physical disability, sensory sensitivity), less education (less experience, less skilled), disorderly use of PPA, work beyond working hours and environmental factors such as equipment have been unsuitable, there was a fire in the workplace and the nature of any hazardous occupation causes of accidents in UPT Balai Yasa Yogyakarta.

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## 1. Introduction

Hazards related to safety and health aspects in a job, in general, can be caused by hazardous activities (*unsafe action*) or hazardous conditions (*unsafe condition*) in its various forms (Ghuzdewan, 2015). Unsafe or dangerous actions can come from human behavior which is influenced by several factors, including educational background, knowledge, skills, psychology, and so on (Ahmad, 2000).

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Human resources as a workforce in the company are inseparable from problems related to Occupational Safety and Health (K3). This refers to the protection of workers from hazards, diseases and accidents due to work and the work environment. In general, a safe and comfortable work environment will make workers avoid work accidents, so that work productivity is maintained. The work environment greatly affects the condition of occupational safety. A poor work environment has a big impact on the occurrence of work accidents. This is because the focus of the workers' work when carrying out their duties can be disturbed. (Priono and Supriyadi, 2020). A work environment that is far from safe and comfortable conditions, and work activities that are not in accordance with OSH regulations are the biggest factors in the occurrence of work accidents (Grahanintyas et al., 2012).

Research conducted by the world body *International Labour Organization (ILO)* states that every day an average of 6,000 people die, equivalent to one person every 15 seconds or an estimated 2.2 million people per year die due to illness or work-related accidents. The K3 level of companies in Indonesia is generally still relatively low. The risk of work accidents is the possibility of losses in a certain period of time, so risk management measures are needed, namely measures taken to achieve, maintain, and improve occupational safety in its installation and operation (*International Labour Office, 1991*). To overcome the occurrence of work accidents that result in the disruption of the production process that causes company losses, it is necessary to know the factors that cause the accident, so that various efforts can be made to prevent it.

The three reasons that cause the K3 aspect to be considered are humanitarian factors, factors in the fulfillment of regulations and legislation, and cost factors (Somad, 2013). These factors must exist and be carefully managed by K3 leaders, so that they are decisive in running the K3 program effectively and efficiently. The most important aspect of a job in preventing work accidents is the fulfillment of all rules in various Standard Operating Procedures (SOPs) that have been set by industry leaders for all workers, regardless of the work unit and type of work (Covan, 1995). In principle, all work accidents can be prevented, because all types of work accidents have causes. If the cause of work accidents can be eliminated, then the possibility of work accidents can be avoided. This principle underlies the development of science in the field of K3 with various accident prevention methods (Ramli, 2013). Accident prevention is a comprehensive effort that must be carried out by K3 managers in the industry.

By definition, a hazard is a circumstance or situation that has the potential to cause losses such as injury, illness, property damage, damage to the work environment, or a combination entirely (Ramli, 2009). The impact caused by the danger that eventually becomes an accident is a great variety of losses and misery, which are accepted by all parties in an industry. In hazard prevention, it is necessary to prepare a mature and appropriate plan with the formulation of the implementation of risk management at the industrial level, so that these steps and policies will be able to maintain the situation of the production process running smoothly according to the expected goals of the industry leadership (Ramli, 2011-b). At the industrial management level, risk management greatly determines the condition of the production process in the long term and is a tool that must be applied both managerially and practically in all work units. The risk management developed is not only limited to OSH risk management, but also includes planned disaster risk management with good management, both related to disasters by human factors and equipment factors (Ramli, 2011-a).

## 2. Research Methods

The type of research used is qualitative descriptive research. Descriptive research is a research method that is carried out with the main purpose of making an overview or description related to an objective state (Afini et al., 2012). The location of this research was carried out at the Technical Implementation Unit (UPT) of Balai Yasa Yogyakarta. The subjects in this study are production workers who have experienced work accidents, namely as many as 17 workers. The data collection technique uses interviews, as well as observations to describe the factors that cause work accidents, and other supporting documents to ensure the validity of the data in the research.

## 3. Results and Discussion

### 3.1. Research Results

Research on factors that affect work accidents was carried out at UPT Balai Yasa Yogyakarta. The results of the interview were obtained as follows.

#### 3.1.1. *Unsafe action*, includes the following factors.

##### a. Labor imbalance

Based on the results of the interviews, some workers stated that work accidents that occurred could be caused by work fatigue or lack of concentration, as the following interview excerpts.

*"I once had a work accident, like my finger was pinched by a spare part, at that time I was tired so I couldn't concentrate..." (Upper frame respondent).*

In addition, some workers who experienced physical disabilities and temporary disabilities due to work accidents also stated that work productivity decreased after experiencing work accidents, as quoted in the following interview.

*"I once fell and cracked my collarbone so I couldn't work hard because I still had a lot of pain... I used to work hard but I fell because I was still not strong and still in pain" (Respondent of the work facilities section).*

Workers who experienced a decrease in visual acuity also revealed as in the following interview excerpt.

*"My visual acuity decreased, when welding, there were sparks that made glare, accidentally my hand was exposed to welding". (Welding section respondent)*

##### b. Lack of education

Based on the results of the interview, the following information was obtained.

*"I once scratched diesel engine components because I had only been working for a few months at that time, so I was not used to those tools and the new work environment" (Respondent of the diesel section).*

##### c. Misinterpreting SOPs, resulting in the wrong use of work tools

The results of the interview with the workforce were obtained as follows.

*"I don't understand what the SOP means... if I use the wrong PPE (Personal Protective Equipment), I have never worn a special mask, but it didn't cause an accident" (Respondent of the work facility section)*

##### d. Carrying out work without authority

Based on the results of the interview, information was obtained that the workforce often works outside their authority, as quoted in the interview as follows.

*"Working outside of authority is often ... Before he is told to work outside his work section, he is usually asked first if he wants and understands, if he wants, he is usually asked for help if the work in his section is finished" (Respondent head of the electric traction & instrument section)*

##### e. Running a job that is not in accordance with his expertise

Based on the results of interviews with workers, the following information was obtained.

*"Doing work that is not in accordance with our expertise is never done, because it is also risky when doing work but not being an expert in that field. For example, it is placed in the metal welding part because it understands the field of welding" (Respondent head of the upper frame)*

##### f. The use of PPE is not disciplined

The results of interviews with workers also stated that some work accidents experienced could be caused by the disorderly use of PPE, as quoted in the following interview.

*"I never wore protective clothing because the weather was hot, I came off, when welding, I was exposed to welding sparks" (Welding section respondent)*

##### g. Transporting excessive loads

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The results of the interview were obtained as follows.

*"If you transport an excessive load, you will never get to the point where it causes an accident, if you think the load to be lifted is too heavy, we need the energy of several people, here there is also a pulley to carry tools that are indeed very heavy"* (Upper frame respondent)

h. Overworking or exceeding working hours

Based on the results of interviews with workers, it is also stated that some workers often work beyond the predetermined working hours, as quoted in the following interview.

*"Here , the working hours are from 07.30 to 16.00, but if there is still work that has not been completed, we usually work overtime until 18.00"* (Respondent head of IT)

3.1.2. *Unsafe condition*, including the following factors.

a. Equipment that is no longer fit for use

As revealed by the workforce, the following information was obtained.

*"The use of tools that are not suitable for use has never been so bad that the tools are really not suitable for use, here it is always checked whether the tools are still suitable for use or not dangerous, you can also use damaged tools ..."* (Cold metal part head responder)

b. Heat hazards in the workplace

The statement of the workforce is as follows.

*"If there is a fire in the workplace, there is a fire such as in the welding part, electricity, but if there is a fire that takes victims, it has never been at least exposed to welding sparks, shocks..."* (Cold metal part head responder)

c. Substandard building security

The results of the interview are as follows.

*"The security of buildings, factories, production parts is now good, it meets the standards, everywhere there are warnings of danger signs, there are already tools that will be used for the first time when a fire or accident for example or an accident then the location of heavy equipment is appropriate so that the danger of accidents can be minimized..."* (Cold metal part head responder)

d. Workers exposed to noise

The information was obtained from the results of the diesel part of the workforce.

*"The noise is that if the loco is being turned on, there are usually those who use ear plugs, some who don't. Accidents because of noise have never been the most after that, most of them are a little deaf if they have to shout just like that..."*

e. Workers exposed to Radiation

The following are the results of interviews with workers in the work facility section.

*"... exposure to radiation is not too frequent, usually those who are often exposed to radiation in the IT part are radiation from electronic items such as computers ... but if you are exposed to radiation to cause an accident, you have never done it"* (Respondent of the work facility section)

f. Under- or excessive lighting and ventilation

Based on the results of the interview as follows.

*"The lighting and ventilation are good enough bright, if it's not cloudy here, it's very bright, if it's cloudy, we usually turn on the lights bright enough for lighting when working, the ventilation is also enough, the wind is not too strong and not too hot either, because if it's hot weather, just turn on the fan"* (Diesel respondent)

g. Dangerous temperature conditions

The following is an excerpt of the interview with the worker, which is as follows.

*"The temperature here is safe, if it's too hot, there is enough cooling and ventilation..."*

h. Excessive security and warning systems

The results of the interview are as follows.

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*"The security of the building and the warning system here are very good, it does not bother us at all, even with such things make us have to remain careful when working. If the security situation here is not excessive, it's normal, we are not always supervised at work" (Respondent of the work facility section)*

i. The nature of the work that contains potential hazards

*"The work here has the potential to be dangerous for accidents, but it all depends on how each individual behaves when working. For example, work in the electrical department has a great potential for fire or electric shock, not a few are also often electrocuted..." (Respondent head of electric traction and instruments).*

### 3.2. Discussion

#### 3.2.1 Unsafe action

a. Labor imbalance

Labor imbalance includes the position of the body at work that causes fatigue in the body, physical disability, temporary disability, and reduced sensitivity of the five senses to something. One of the factors that affects the imbalance of labor in doing their work is the position of the labor body. The results of interviews with workers also asked about whether the position of the worker's body was comfortable or uncomfortable when doing their work. The position of the worker's body is important to know because it can show the level of worker fatigue. The majority of the body positions of workers when doing work, including bending, squatting, standing with an unstraight back, and so on.

In addition, the results of interviews with workers also stated that physical disabilities and temporary disabilities experienced by workers can be an inhibiting factor in doing work, so that it can cause work accidents. The level of sensitivity of the five senses of the workforce can also affect the imbalance of the workforce in carrying out work activities. The lack of sensitivity of the five senses in the workforce, which can include hearing and vision, may be due to a lack of hearing and seeing (nearsightedness) causing them to be in unsafe working positions, so that they are at risk of work accidents. The results of the analysis can show that uncomfortable body positions at work, physical disabilities, temporary disabilities, and sensitivity of the five senses to something, can affect the occurrence of work accidents and unsafe actions of workers.

b. Lack of education

There are several factors that can lead to a lack of education in the workforce, such as lack of experience, misunderstanding related to an order and lack of skills of workers. The results of the interviews with the workers also stated that they were related to the last education they took and their working period at UPT Balai Yasa Yogyakarta, to find out the relationship between these factors and the occurrence of work accidents. The results of the study also show that the factors of lack of experience and lack of skills of the workforce in doing their work such as the use of tools are enough to trigger the occurrence of work accidents. In addition, the factor of misinterpreting an order is also very risky to cause work accidents.

c. Misinterpreting SOPs, resulting in the wrong use of work tools



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The procedure for using good and correct work tools is always explained to the workforce, but there are still some workers who do not really understand so that it causes confusion about the procedure. This is known by asking workers regarding their understanding of their field of work and having used the correct and appropriate PPE. From the results of the study, it is known that there are still some workers who do not understand SOPs, thus causing errors in the use of work tools.

d. Carrying out work without authority

UPT Balai Yasa Yogyakarta already has a very precise and neat division of work units. This is based on the results of interviews with workers in each work unit and those who have experienced work accidents to find out several factors that cause the work to run outside of authority. The results of the research obtained information that there have never been work accidents caused by working outside the authority of the workforce. This is because the workforce ensures skills and whether or not they are willing to do the job.

e. Running a job that is not in accordance with his expertise

To find out whether the workforce has worked in a work unit that is not their expertise, it is known by asking whether they have ever carried out work outside their expertise or not. The results of the study can be found that workers never work outside their skills because when workers do a job that is not their expertise, it can cause a risk of accidents due to work.

f. The use of PPE lacks discipline

The use of PPE includes the wearing of work clothes, safety shoes, masks, gloves, helmets and so on. To find out whether workers use PPE only pretending or because of their own awareness, it is done by asking whether workers understand the purpose of using PPE or not. The results of the study are known that the workforce understands the purpose of using PPE, so that when workers use it at work, because of their respective awareness to avoid the risk of work accidents. There have never been accidents due to the use of PPE that is not disciplined, accidents occur usually because workers do not use them.

g. Transporting overload as the negligence of the worker himself

Transporting excessive loads carried by labor can lead to work accidents. The results of the study show that during work, the workforce has never had a case of work accident caused by carrying an excessive load. This can happen because UPT Balai Yasa Yogyakarta has carried out risk control related to transporting excessive loads, namely by using special tools to carry heavy tools so that the risk of work accidents due to carrying excessive loads can be minimized.

h. Overworking or exceeding working hours

Working more than working hours is an addition to working hours from mandatory working hours. The results of interviews by workers at UPT Balai Yasa Yogyakarta can be seen that the workforce often works beyond working hours and the use of holidays. This is because workers have certain targets, causing fatigue that results in decreased productivity and work activities that are not optimal. Working more than working hours is very risky to cause work accidents because when the workforce is exhausted, they become unfocused and lack of concentration at work, thus triggering them to commit unsafe actions at work, especially with a very high potential for danger at work.

### 3.2.2 Unsafe condition

a. Less suitable equipment

Most of the equipment used at UPT Balai Yasa Yogyakarta still meets the standards in terms of feasibility because there is always a check on the tools used, but there are some tools that have long fallen and been hit by the workforce underneath. This confirms that the existence of tools that have been consumed by age for a long time is very dangerous for workers and causes work accidents.

b. There is a fire at work

The work environment is at risk of fire, but the workforce has been equipped with trainings on first handling fire incidents and eliminating the risk of fire in the workplace, so that there has

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never been a work accident that causes a fire due to the danger of fire in the workplace, but work accidents

occurred only to sparks that hit one part of the worker's body which is usually directly handled by the company's doctor who is always there to serve the complaints of the workers.

c. Substandard building security

The condition of the building itself has met the standards because it has adequate ventilation so that it allows workers to feel comfortable with the air temperature in the building, if the workers feel hot they have been provided with fans and get enough lighting, there are also lights that can be used when the workforce feels lacking with the existing lighting. Then there are signs or hazard warning signs such as fire alarms, oxygen and SOPs in each work unit.

d. Exposed to noise

The noise level in the building is very high but only at certain times, for example during the test of the locomotive that is turned on, but this can be anticipated by the workforce by using *earplugs* that has been prepared. Even though it has been provided, some workers also feel uncomfortable with the use of *ear plug* so that they do not use ear protectors which can result in the workforce experiencing a decrease in the hearing threshold. The results of the study can be seen that there has never been a direct work accident due to exposure to noise, but circumstances like this have the potential for work accidents and unsafe actions from the workforce.

e. Exposure to radiation

During work activities, workers can be exposed to radiation hazards, but not on a dangerous scale. Several accidents have occurred due to electric shocks, causing burns that are not too severe and electrocuted. Continuous exposure to radiation will cause a disease in the long term.

f. Lack of lighting and insufficient or excessive ventilation

In the workplace, it is known that the lighting and ventilation in the building are quite adequate. This is based on the results of research which states that the conditions in the building are bright enough and have large ventilation so that the lighting in the building has been fulfilled and has an air temperature that is not too hot or there is too strong wind. So, the UPT Balai Yasa Yogyakarta building seems cooler.

g. Dangerous temperature conditions

The temperature conditions inside the UPT Balai Yasa Yogyakarta building are not dangerous because they can be adjusted. The results of the study show that when the building condition is too hot, workers can control the danger by turning on the fan that has been specially provided. Therefore, in this case, the workforce has never experienced a work accident due to extreme temperatures.

h. In a state of excessive security and excessive warning system

The state of security and warning systems in the building is not excessive because it is part of an effort to prevent the risk of work accidents. The existence of these security and warning systems makes workers more aware and aware of the risk of danger at work, so that it can minimize the possibility of work accidents.

i. The nature of the work that contains potential hazards

Every worker is aware of the risks and potential dangers at work so they are always aware of work accidents that may occur by using personal protective equipment and always be careful. However, work accidents can still occur even on a lighter scale, when carrying out work that does have the potential for work accidents. From the results of the study, it is known that occupational factors that contain potential hazards affect the occurrence of work accidents.

The results of the study show that there are factors that affect work accidents, including unsafe behavior which includes the improper position of the worker's body at work, so that it easily causes fatigue in the body, lack of knowledge, lack of skills and experience of workers, physical disabilities or temporary disabilities, to lack of sensitivity of the five senses to something. Other factors that affect work accidents are unsafe conditions which include exposure to noise and radiation, fire hazards in

the workplace and others. This result is in accordance with other studies that state that one of the factors causing work accidents is the presence of workers who are disorderly in using PPE. The results of this study are also known that one of the causes of work accidents at UPT Balai Yasa Yogyakarta is because workers are not orderly in using PPE.

The difference in the results of this study is that in other studies, it is known that the factors that cause work accidents are disorderly use of PPE and the industry does not hold regular training. This is in line with the statement in the literature, that regular training greatly determines the quality of the skills of workers in a workplace (Notoatmodjo, 2012). In this study, the results were obtained that the factors that cause work accidents at UPT Balai Yasa Yogyakarta are labor imbalance (body position that causes the body to get tired easily, physical disabilities, temporary disabilities, and sensitivity of the five senses), lack of education (lack of experience and skills), disorderly use of PPE, working beyond working hours, equipment that is not suitable, there is fire in the workplace, and the potentially hazardous nature of the job. This is in line with the statement in the literature, that a type of work that is designed holistically in various aspects related to workers and their workplaces, will ensure the sustainability of ideal OSH conditions and achieve high work productivity (Ridley, 2006).

This study is also in accordance with other studies that say that one of the factors that cause work accidents is the condition of the machines and tools used, in this study it was also found that equipment that is not suitable for use causes work accidents. In theory, it is also explained that failure can arise as a result of the correct system or work procedure, but it is outdated, that is, it cannot function to keep up with technological developments, so it is not effective and efficient (Composer, 2006). The difference between the results of another study and this study is in the study that says that the factors that cause work accidents are dangerous acts, dangerous conditions, and management systems. In this study, the results were obtained that the factors that caused work accidents at UPT Balai Yasa Yogyakarta, were labor imbalance, lack of education, disorderly use of PPE, working beyond working hours, equipment that was not suitable, there was a fire in the workplace, and the nature of the work that was potentially dangerous, as has been theoretically explained in a literature (Rahmania et al., 2013).

#### 4. Conclusion

1. Factors in workers (*unsafe action*), namely labor imbalance (body position that causes body fatigue easily, physical disability, and sensitivity of the five senses), lack of education (lack of experience, lack of skills), disorderly use of PPE and working beyond working hours, cause work accidents at UPT Balai Yasa Yogyakarta.
2. Factors in the work environment (*unsafe condition*), namely equipment that is no longer suitable for use, there is a fire in the workplace and the nature of the work that has the potential to cause work accidents at UPT Balai Yasa Yogyakarta.

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