Risk Analysis of Loading/Unloading Activities with Job Hazard Analysis (JHA) (Study Case: PT Crieta Logistics)

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Abstract. PT Crieta Logistics is a logistics company in Indonesia that offered transportation, delivery services, and warehousing services throughout Indonesia. In the operational activities, loading/unloading activities always involve workers and material tools to help carry out activities. The activities carried out will not escape the risks that may occur, In identifying and analyzing potential hazards and risks, the Job Hazard Analysis (JHA) method can be used. Through this research the authors want to obtain the activity with the highest potential hazard in the activity loading/unloading PT. Crieta Logistics. Based on the high-risk value, the authors gives suggestions requiring the use of Personal Protective Equipment (PPE) in loading and unloading activities and holding a briefing regarding the SOP for loading and unloading activities to be carried out.

Keywords: Risk, JHA, Risk Assessment, Operational, Loading/Unloading.

1 Introduction

All activities carried out in activities always involve humans, machines, materials and process stages that can cause hazards with different levels of risk and lead to accidents and occupational diseases. Errors in operating forklifts, loading and unloading processes and then arranging pallets and goods are inappropriate and unsafe, as well as using inappropriate personal protective equipment (PPE) or not using PPE are some of the actions that can lead to the emergence of potential work hazards from the aspects of Safety, Health, Work and Environmental Safety (K4L) are important for every company to pay attention to [1]. Potential hazards or so-called hazards exist in almost all workplaces. The existence of these hazards can result in accidents or incidents that have an impact on people, equipment, materials and the environment [2]. Workers are an asset to the company and are very important in loading/unloading activities, so efforts are needed to ensure that the level of health and safety of workers is always safe. The situation in loading/unloading activities always allows dangers to occur, even more so during this Covid 19 pandemic. The sources of these potential hazards must be controlled to minimize the impact of disease and the safety of workers. PT Crieta

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Logistics is a private company located in North Jakarta. PT Crieta Logistics is a service provider of Marine Cargo Expedition (EMKL), Railway Cargo Expedition (EMKA), cargo, container, warehousing, and trucking services that serve routes throughout Indonesia. With so many operational activities in the field, there will be a high possibility of an accident risk. PT Crieta Logistics has several activities where each activity has a potential occupational accident hazard, one of which is the loading/unloading process where workers deal with various types of loads which may include chemicals or flammable substances which will increase the potential hazard if workers do not handle them in accordance with procedures. and the use of material handling tools that can increase the potential for work accident hazards if not used according to procedures [3].

Due to the large number of operational activities and the lack of awareness of company workers in handling activities that should be in accordance with the Standard Operation Procedure (SOP), it is therefore necessary to have an evaluation to be able to prevent accidents properly and effectively, and to identify all hazards that can cause various accidents [4]. Then it is necessary to assess the risk level of the hazard and determine corrective actions to control the hazard. In addition, control is carried out to reduce losses caused by illness and accidents. The loss is either financial/economic or non-financial. Efforts should be made to prevent sources of hazards in the workplace in order to achieve good workforce maintenance. Awareness needs to be instilled in workers through good counseling and guidance, so that they realize the importance of safe work for themselves and the company [5]. In determining all potential risks of occupational accidents in operational activities, especially loading/unloading activities at PT Crieta Logistics, it is necessary to identify hazards in each of the activities in these activities. To identify and analyze potential hazards the authors use the Job Hazard Analysis (JHA) method. Job Hazard Analysis (JHA) or commonly referred to as Job Safety Analysis (JSA) is a systematic and gradual study of all potential hazardous events contained in each work step, to be able to determine the various control actions needed to prevent or reduce the impact of the incident. dangerous during the process of preparing and carrying out a job. The reason the authors choose to use the Job Hazard Analysis (JHA) or Job Safety Analysis (JSA) method to analyze hazard risk is because this method is generally used by companies and is also easy to implement.

2 Literature Review

2.1 Health, Safety, and Environment

Occupational Health and Safety (OSH) is our effort to create a healthy and safe work environment, so as to reduce the probability of work accidents/diseases due to negligence which results in demotivation and work productivity deficiency. In general, work safety can be considered as a science and its application relating to machines, appliances, tools, materials and processing, foundation work and the work environment and how to perform the work to ensure the safety of workers and the company's assets in order to avoid accidents and other losses [6]. Safety also includes the provision of Personal Protective Equipment (PPE), machine maintenance and humane working hours' arrangements. In OSH there is a term known as Occupational Health, which is a specialization in health sciences as well as practice aimed at keeping workers or community workers obtain health standard as high as both physical, mental,

social, with business ventures preventive and curative, against illness or health problems caused by the factors of work and working environment, as well as against common illness [7].

2.2 Hazard Category

There are many type of hazard, as the following:

- Category A: Potential hazards with long-term health impacts
  A health hazard will arise when a person comes into contact with something that can cause disturbance/damage to the body when there is excessive exposure. Health hazards can cause illness caused by exposure to a hazard source in the workplace.
- Category B: Potential hazards that pose an immediate risk to safety
  This category deals with problems or events that have the potential to cause immediate injury. These injuries are usually caused by work accidents. This usually happens when the risks are not well controlled. When safe work procedures are not available or vice versa but are not followed.
- Category C: Risk to well-being or comfort
  Facilities related to occupational health are often overlooked because they are not seen as having a direct impact on productivity. By providing health-related facilities, companies get tangible benefits for the company that have a direct impact on productivity. It is also a simple way for management to show that the facilities provided are beneficial for the health of workers.
- Category D: Personal and psychological risks
  If a company wants to maximize productivity, it needs to create a workplace where workers feel safe and respected. This issue goes beyond physical safety and includes protecting the personal well-being, dignity and mental well-being of workers. Intimidation or harassment often threatens workers' sense of well-being and safety in the workplace.

2.3 Risk Management

Risk is a hazard, consequence, or consequence that can occur as a result of an ongoing process or future event. Risk can be interpreted as a state of uncertainty, where if an undesirable situation occurs, it can cause a loss. Risk management is an application of general management that tries to identify, measure, and deal with the causes and effects of uncertainty in an organization or company [4]. Thus, risk management is needed to avoid and minimize risks that will arise or be faced by the company. Defining risk management as a field of science that discusses how an organization or company applies measures in mapping various existing problems by placing various management approaches in a comprehensive and systematic manner [8].

To implement risk management comprehensively there are several stages that must be carried out by a company. The stages included in the risk management process include:

- Risk Identification
  Risk identification is a systematic effort made to identify and find sources of potential risks in existing activities.
- Identify the forms of Risk
  At this stage identify forms of risk in more detail based on the results of risk identification.
- Risk Assessment

assessing every possible risk that can be seen from how big the effect of the risk is and the probability of how many times the risk occurs.

- Risk Control
  Risk control efforts must be based on a control hierarchy starting from the most effective (most effective) to the least effective (least effective) such as elimination, substitution, technical, administrative control, and the lowest is the provision/use of personal protective equipment (PPE).
- Evaluation
  Evaluation is carried out to communicate risks or hazards to all parties with an interest in the activities of the organization or company. The results or process of developing risk management are also consulted with all parties such as workers, experts, business partners, suppliers and others who may be affected by the implementation of risk management.

2.4 Job Hazard Analysis

Job Hazard Analysis is a technique that focuses on job tasks as a way to identify hazards before they occur [9]. It focuses on the relationship between workers, tasks, tools, and the work environment. Ideally, once you have identified an uncontrollable hazard, you will take steps to eliminate or reduce it to an acceptable risk level [1]. Can help prevent workplace injuries and illnesses by monitoring workplace operations, establishing proper work procedures, and ensuring that all employees are properly trained. One of the best ways to determine and establish proper work procedures is to perform a job hazard analysis. A hazard analysis job is one component of a larger commitment to a safety and health management system.

2.5 Guidelines in Risk Assessment and Classification

To provide a risk assessment for each identified potential hazard, the fine method is used for risk assessment based on [10][11][12].

Table 1. Value for exposure measurement.

Level	Description	Rating
Continously	Often happens in a day	10
Frequently	Likely to happen once a day	6
Occasionally	Happens once a week to once a month	3
Infrequent	Happens once a month to once a year	2
Rare	Rarely happening	1
Very rare	Very rarely happens	0.5

Table 2. Value for consequence measurement.

Level	Description	Rating
Catastrophe	Fatal/severe damage	100
Disaster	Permanent damage	50
Very Serious	There is a disability/illness	25
Serious	Serious injury, need medical attention	15

Important	Moderate injury	5
Noticable	Minor injury	1

Table 3. Value for possibility measurement.

Level	Description	Rating
Almost certain	The most frequent occurrences	10
Likely	50% chance of accident	6
Unusual but possible	Unusual but possibly happens	3
Remotely possible	A small possibility of happening	1
Conceivable	Never happened but there is a possibility	0.5
Practically impossible	Very unlikely to happen	0.1

After getting each value from Consequences, Probability and Exposure, then the level of risk is calculated with the following formula:

$$Risk\ score = Consequence \times Probability \times Exposure \quad (1)$$

Then the results of these calculations are adjusted according to the level of risk based on [13], the level risk as follows :

Table 4. Risk/level priority.

Level of Risk	Description	Action
>350	*Very high*	Cessation of activity, risk is reduced to an acceptable limit
180-350	*Priority 1*	Need to be handled as soon as possible
70-180	*Substantial*	Requires technical improvement
20-70	*Priority 3*	Need to be monitored and noticed on an ongoing basis
<20	*Acceptable*	The intensity of activities that pose a risk is reduced to a minimum

3 Methods

First, the author makes observations on loading/unloading activities in the company and sees what activities are carried out in loading/unloading activities. Then after the observation the author can identify the potential hazards contained in the company's loading/unloading activities. After that is data collection, at this stage the authors collect data related to the problems needed to support the problem solving process both by observation and interviews. Then, at the data processing stage, the writer processes the data obtained at the data collection

stage into a fine table to obtain the results of a risk assessment which is then analyzed using the job hazard analysis (JHA) method. Then at the last stage this is the final result of the predetermined formulation. After getting the results from data analysis, conclusions and suggestions can be drawn which can later be used as material for evaluation of improvements for the company.

4 Result and Discussion

This research focuses on the process of receiving and loading and unloading in the company. As for the data collection process, information about the stages of receiving goods from the company is obtained, which can be seen in the following flow chart.

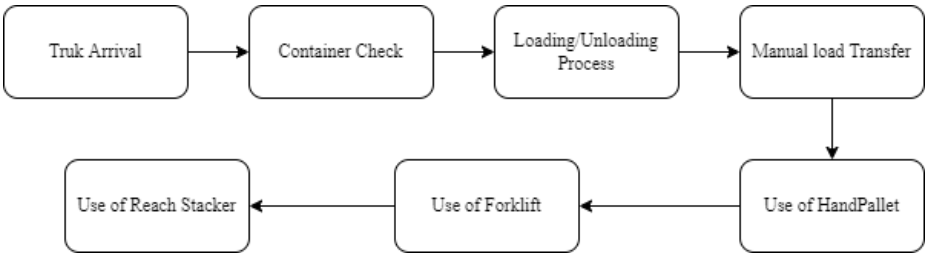

Fig. 1. Loading/unloading activity.

4.1 Result for Job Hazard Analysis

Next, this part describes the risk identification process. In the process of risk identification, the authors conducted observations and interviews with company stakeholders. The results of the risk identification are as follows:

Table 5. Result for job hazard analysis.

Activity	Potential hazard		Impact	*Risk Score*	*Level of Risk*
	Source of Hazard	Hazard Category			
Truck arrival	Workers hit by truck	B	Serious Injury	300	*Priority 1*
Container check	Workers fall	A	Minor injury	270	*Priority 1*
	Workers tripped, hit by sharp objects	A	Minor injury	7.5	*Acceptable*
Loading and unloading process	Worker falls from truck	A	Minor injury	45	*Priority 3*
	Workers exposed to dust	A	Long term hazard	90	*Substantial*
	Workers exposed to loads	A	Long term hazard	90	*Substantial*

Activity	Potential hazard		Impact	*Risk Score*	*Level of Risk*
	Source of Hazard	**Hazard Category**			
Manual load transfer	Workers crushed by goods, workers squeezed	B	Minor injury	22.5	*Priority 3*
	Workers crushed by the load, workers squeezed	B	Minor injury	22.5	*Priority 3*
	Workers exposed to loads	A	Long term hazard	90	*Substantial*
	non-ergonomic working conditions	A	Long term hazard	270	*Priority 1*
Hand Pallet Usage	Workers got sprain	A	Minor injury	90	*Substantial*
	Workers got hit	B	Minor injury	7.5	*Acceptable*
	Workers hit by the load	B	Minor injury	2.5	*Acceptable*
Forklift Usage	Workers hit by forklift	B	Serious Injury	90	*Substantial*
	Workers hit by the load	B	Fatal, Serious Injury	300	*Priority 1*
	Forklift hit a truck	B	Medium loss	180	*Priority 1*
Reach Stacker Usage	Workers got hit	B	Serious injury	300	*Priority 1*
	Workers hit by the load	B	Fatal	300	*Priority 1*
	The load hit a building or other vehicle while being transported	B	Medium loss	25	*Priority 3*

4.2 Analysis of Potential Hazards

Based on the results of data processing that has been done, the authors obtain some discussion of the analysis. The following is a discussion of the analysis of data processing:

- Truck Arrival
  The potential danger from crashing into workers is included in the level of risk Priority 1 category where the Consequence value = 100 because there is a potential for death, the Probability value = 0.5 because nothing has happened but is likely to happen, and the Exposure value = 6 due to frequent impact exposures. For now the company has carried out control by using parking guides and using lines as truck parking restrictions.
- Container Check

The potential danger from falling when climbing is checked into the Priority 1 category with a consequence value = 15 because there is a potential for a worker who falls will experience fractures, then a Probability value = 6 because the probability of falling and not falling is 50%, and an Exposure value = 3 which is likely to happen quite often. Until now there is no control regarding the potential dangers of this activity from the company. Henceforth, the potential hazard from workers tripping or being hit by sharp objects is included in the Acceptable level category with a Consequence value = 5 where there is no serious injury such as a scratch, then the value of Probability = 0.5 because it has never happened but there is a possibility that this potential hazard will occur, and the Exposure value = 3 because the probability is quite frequent. until now there is no control regarding the potential dangers of this activity.

- Loading and Unloading Process
  In this activity, the potential hazard of workers being crushed or crushed by goods is included in the Priority 3 category with a Consequence value = 15 because there is a potential for workers to experience bone fractures, then the Probability value = 0.5 because it has never happened but there is a possibility, and the Exposure value = 3 which is likely to happen quite often. control that may be done to prevent this potential hazard is to keep a distance from piles of goods so that workers are not crushed by goods. Hence the next potential hazard that may occur in this activity is the worker falling from the container truck while loading and unloading. This potential hazard is included in the Priority 3 level risk category with a Consequence value = 15 because there is a possibility that the worker will experience a fracture, then a Probability value = 1 because it has never happened but there is a possibility that this potential hazard will occur, and an Exposure value = 3 which is likely to occur quite often. At this potential, the control that can be done by the company is to require workers to use Personal Protective Equipment (PPE). Henceforth, the potential for workers to be exposed to dust in the container as well as to the goods being loaded and exposed to cargo that could be chemical in nature. This potential hazard is included in the substantial category with a Consequence value = 5, then a Probability value = 6, and an Exposure value = 3 because the exposure is quite frequent. In this potential, the control that can be done by the company is by telling workers to use masks and adequate PPE.
- Manual Transfer of Goods
  One of the potential hazards from this activity is that workers are hit by cargo, this potential hazard is included in the Priority 3 category with a Consequence value = 15 because there is a potential for workers who are struck to experience bruises and fractures if the load being transported is heavy enough, then the value of Probability = 0.5 because it never happened but there is a chance it will happen, and the Exposure value = 3 because it is a possibility that happens quite often. Furthermore the possibility of workers who are dislocated due to manual transportation and the potential of workers who are exposed to loads. These two potential hazards are included in the substantial category with a consequence value = 5 because they only cause injuries such as injuries to the knee, leg or waist that are not serious injuries, then the Probability value = 6 because the possibility of a worker sprains is quite large. And the Exposure value = 3 because of the rare possibility. the way to prevent worker sprains is to use good transportation techniques or use Material Handling assistance. The next potential is the potential for long-term hazards, namely the potential caused by non-ergonomic working conditions. This potential is included in the Priority 1 category

with a Consequence value = 15, then a Probability value = 6, and an Exposure value = 3. This potential can be controlled with the help of the use of Material Handling.

- Use of Hand Pallet
  The potential danger from using a hand pallet is that a worker is hit by a hand pallet. This potential risk is included in the Acceptable category because it only causes minor injuries such as bruising with a Consequence value = 5, then a Probability value = 0.5, and Exposure = 3 because there is a possibility that it will occur 1 time. a week to once a month. Another potential hazard is that workers are hit by cargo that is not properly placed on the hand pallet, this potential risk is included in the Acceptable category because it only causes minor injuries, with a Consequence value = 5, then a Probability value = 0.5 and an Exposure value = 1 because of the possibility which rarely happens. The way to control these two potential hazards is the use of hand pallets in accordance with SOP's.
- Use of Forklifts
  The potential danger from using a forklift is a worker who is hit by a forklift, this potential hazard is included in the Substantial category with a Consequence value = 15 because it can cause broken bones and serious injuries, then a Probability value = 3 because this is an unusual thing but it is possible to happen , and the Exposure value = 2 may occur once a month to 1 year. The way to control this risk is to require workers to keep a distance when operating using a forklift. Then the next potential hazard is the possibility of workers being hit by a load transported by a forklift, this potential hazard is included in Priority 1 with a Consequence value = 100, then a Probability value = 3, and an Exposure value = 1. One form of risk control is to keep a distance from the forklift. and not near the cargo being carried. The potential danger of a forklift hitting a truck is a potential that is included in the Priority 1 category where urgent handling is needed regarding this matter. This potential has a Consequence value = 5, then a Probability value = 6, and an Exposure value = 6. One form of risk control is to socialize the use of SOPs on forklifts and conduct training for workers.
- Use of the Reach Stacker
  The potential danger that may arise from the use of the reach stacker is the potential for workers to be hit, this potential is included in the priority category 1. This potential hazard has a Consequence value = 100 because there is a possibility that the worker who is hit has a broken bone and the worst is death then the Probability value = 3 , and Exposure value = 1. Furthermore the next potential hazard that may occur is the load hitting a building or vehicle while being transported, this potential is included in the Priority 3 category with a Consequence value = 50, then the value of Probability = 0.5, and the value of Exposure = 1. Both of these risks can be control is carried out by using a good and correct SOP reach stacker and training workers. And the last potential that may occur is workers who are hit by a load while being transported, this potential is included in the priority 1 category with a Consequence value = 100 because it can cause death, then the Probability value = 3, and the Exposure value = 1. There is no special control regarding the potential in this case, workers only have to avoid being under the load while being transported.

4.3 Discussion

By conducting a risk assessment using the JHA technique which refers to OSH and AS/SNZ for risk management, the results of research that has been carried out regarding the potential hazards

of work accidents in the loading and unloading activities of PT Crieta Logistics, it can be concluded as follows:

- From the results of the risk analysis using Job Hazard Analysis (JHA) with the Fine table method, 14 potential hazards were obtained from 7 activities that occurred in the loading and unloading process. A total of 5 activities became the main focus of risk control due to the high level of risk, as follows:
    1. Truck arrival activity
    2. Container checking activity
    3. Load transfer activities
    4. Forklift activity
    5. Activity using reach stacker
- After analysis using Job Hazard Analysis, the value of the potential for each risk is obtained and based on the value obtained, there is 4 levels of risk level where each level has its own meaning. And the meaning is as follows:
    1. Acceptable
       Where the company should reduce the intensity of activities that pose a minimum risk.
    2. Priority 3
       Companies are required to monitor and pay attention to the potential for work accidents on an ongoing basis.
    3. Substantial
       The company is required to make technical improvements.
    4. Priority 1
       Companies are required to take immediate action regarding activities that have this risk, such as changing methods, reducing the use of these activities requiring the use of a full body harness for the protection of workers.

4.4 Suggestion

There are several suggestions that can be suggestions for improvement for companies in the field of occupational safety and health in the loading/unloading process, as follows:

- Require the use of Personal Protective Equipment (PPE) in loading and unloading activities.
- Held a briefing regarding the SOP for loading and unloading activities to be carried out.

Suggestions for further researchers are that the results of this study can be used as a reference, comparison material and consideration for more in-depth research on risk analysis using additional methods such as statistical analysis, computer models, simulations, fault tree analysis, and others.

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