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Analysis of Potential Hazards in the Palm Oil Processing Process at PT. Karya Tanah Subur using Job Safety Analysis (JSA)

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ABSTRACT

PT. Karya Tanah Subur (KTS) is a palm oil processing industry located on Jalan Gemmpang-Tutut, Padang Sikabu Village, Kawai XVI District, West Aceh District. Based on the results of observations and interviews conducted with the person in charge of the factory, it is known that there are potential hazards that occur during the production process. The potential hazards that occur cannot be separated from various risks in the work environment, as well as negligence and also non-compliance by workers in using PPE. The purpose of this research is to identify the potential hazards at the Loading Ramp, Sterilizer, and Thresher stations and then assess the risk level of these potential hazards and determine control measures for these risks. The method used in this research is Job Safety Analysis (JSA). The results of the analysis revealed that the potential hazards in the 3 areas studied were the Ramp Loading, Sterilizer, and Thresher stations. The potential hazards found in the Ramp Loading area were being pinned by the tailgate of the FFB transport truck, being crushed and punctured by FFB thorns, falling into a pile of FFB, being stabbed by a Gancu. Potential hazards at the Sterilizer Station include exposure to hot steam, electric shock, heat at the end of the lorry, being injured by capstan ropes and slipping due to slippery floors. The potential hazards at the Thresher station include being exposed to the heat of the lorry when it is unable to attach the rope that holds the crane, falling from the workplace, being crushed by fruit that has been boiled in heat. The highest potential hazards are at the Sterilizer station, where workers' hands are injured by capstan ropes and the slippery floor causes workers to slip, and at Thresher stations, where boiled fruit is crushed. Control efforts that can be proposed are to hold internal outreach to company workers which discuss risks in the workplace as well as discussions about occupational health and safety so that workers always use complete PPE in the workplace.

I. Introduction

Oil palm is a superior natural potential in the plantation/agriculture sector. Processed palm oil will produce Crude Palm Oil (CPO). This CPO can be reprocessed into several derivative products, one of which is cooking oil which we often use every day [1]. The palm oil trade has enormous profit potential so that many palm oil industries compete in producing high quality products that are profitable for the company. Good product quality cannot be separated from the influence of human intervention (labor). In carrying out work, humans are also not free from the potential that can endanger their safety because every job has risks. In general, these risks can be caused by two factors, namely the human actions themselves and the conditions of the work environment [2].

PT. Karya Tanah Subur (KTSis one of the palm oil processing industries located on Jalan Gemmpang-Tutut, Padang Sikabu Village, Kawai XVI District, West Aceh Regency. The product produced is Crude Palm Oil (CPO) or crude palm kernel oil (PK) and its shells. PT. KTS was

founded in 1987 and officially started the production process in 1993 with a processing capacity of 60 tones/hour. The smooth production process must be supported by good facilities, workforce and work environment, especially for the safety and health of the workforce so they can work properly. In its production activities PT. This KTS has implemented a K3 system (Occupational Safety and Health) but based on the observations of researchers there are still several accidents that occur during the production process. This is inseparable from the various risks to the work environment or the negligence and indiscipline of the workers themselves which can be seen from the noisy working environment, rather slippery production floors and workers who do not use PPE or do not comply with company SOPs. If an accident occurs, it will not only harm workers but the company will also be harmed because of the loss of productive time to produce goods or services [3].

Based on the problems above, it is necessary to analyze the potential hazards in the palm oil production area. The method used is Job Safety Analysis (JSA). JSA is a systematic and gradual review of all potential hazardous events that exist at each stage of work with the aim of being able to determine the various control measures needed to prevent/reduce the impact of hazardous events on a job [4]. By using the JSA method we can identify any potential hazards that exist during palm oil processing and can assess the impact of these hazards.

Previous research using the JSA method is by [5], Based on the results of the analysis, it is known that the highest hazard potential is found in work activities at height and welding which are included in the substantial hazard category. Recommendations that can be made are, supervising workers in using PPE, campaigning for a K3 culture every time they start work, prohibiting placing flammable items in the work location, making Management Safety Data Sheets (MSDS), setting a safe distance while working and taking good care of the household.

Other previous research that discusses the use of the JSA method is by [6], Based on the results of the analysis, it was found that there was a danger at the stages of the tramming ore process at ETO (exportable transit ore) in Buli, namely being crushed, crushed, electrocuted and noisy. The types of hazards are a crash, unit tripping over a rock, unit slipping, unit falling on a rock, unit hitting an embankment, and the Rump door breaking. The types of hazards that exist in the Material Arrangement Stage for barge workers are electric shock, noise, and the unit slipping from the ore pile.

II. Job Safety Analysis (JSA)

Job Safety analysis (JSA) is a useful technique for identifying and analyzing hazards or risks in a job [7]. JSA can be interpreted as a tool or technique that is used as a material consideration in identifying potential hazards or risks that exist in one's work as well as being a reference for implementing appropriate controls in efforts to prevent accidents [8].

In analyzing the size of the risk or not, it is necessary to refer to a scale that measures the severity and level of probability of an accident. The following is a table of severity measurements:

Table 1. Severity measuring scale

Level	Description	Definition
1	*Negligible*	If there is very little impact on humans, the production process, property or cause physical harm for at least 15 minutes.
2	*Minor*	If there is a minor injury but it is enough to be treated by the first aid team and/causing one working day lost or less rang.
3	*Moderate*	If the injury persists, medical attention is required, resulting in at least two days absence from work.
4	*Major*	If there is a serious injury that requires hospital treatment and or causes work days lost for more than 2 days.
5	*Catastrophic*	If the collision occurs it results in permanent or partial disability or even death

The following is a table of measuring scales for the probability that an accident will occur:

Table 2. Likelihood measuring scale

Level	Description	Definition
5	*Almost*	Accidents happen once a month
4	*Likely*	Accidents happen every 2-10 months
3	*Possible*	Accidents occur with a range of 1-2 years

2	*Unlikely*	Accidents occur with a span of 2-5 years
1	*Rare Certain*	Accidents happen every 5 years

The results of the identification of the level of severity and the level of probability of occurrence are combined in a risk matrix table that functions to combine the level of severity and the level of probability of an accident. The risk matrix table is a table that displays the relationship between the two variables between likelihood (level of likelihood) and consequence (severity level) where both of these have a risk relationship [9]. The following is a risk matrix table:

Table 3. *Risk Matrix*

Risk Frequency	**Risk Impact**				
	1	**2**	**3**	**4**	**5**
5	H	H	E	E	E
4	M	H	H	E	E
3	L	M	H	E	E
2	L	L	M	H	E
1	L	L	M	H	H

Keterangan: :
L = *Low*
M = *Medium*
H = *High*
E = *Extremely*

III. Method

A. Time Place and of Research

a. Place of Research

This research was conducted at PT. Karya Tanah Subur (KTS) located on Jalan Kaway XIV, Padang Village, Sikabu District, West Aceh Regency

b. Time of Research

The time for conducting this research is July-November 2022

B. Data Collection Methode

a. Data Used

The data used are primary data and secondary data. Primary data is data taken by researchers directly from the data source [10]. Primary data in this study is data from observations and interviews with workers or operators in the PT.KTS production process.

Secondary data is data taken by researchers indirectly in other words secondary data is data obtained from sources other than respondents [10]. Secondary data used in this study is like a general description of the company.

b. Data Collection Technique

Data collection techniques were carried out by means of observation and interviews. Observation is the process of collecting data by directly observing the place or location of research [11]. Interview is a data collection technique through direct interaction with the interviewer giving questions and being answered directly by the interviewee [12].

C. Data Processing Methods

The data processing method used is the Job Safety Analysis (JSA) method. The following are the steps for implementing JSA [13]:

- Selecting work to identify potential hazards
- Dividing work into several process activities
- Identify potential hazards arising from the activity process
- Determine controls for potential hazards

IV. Results and Discussion

From the results of identifying potential hazards in the palm oil production process at PT. In KTS there are several stations that have the highest hazard risk compared to other stations, namely the Loading Ramp Station, the Sterilizer Station, and the Thresher Station. The results of identifying potential hazards from each of these stations are presented in the discussion below.

A. Identification of Potential Hazards at Loading Ramp Stations

The steps at the Loading Ramp station are:

- Opening the tailgate for the FFB transport truck
- Unloading FFB from trucks
- Examination of FFB under the storage tanks
- Raise the fruit that is not good after the grading process into the truck bed

Based on the process steps, a hazard risk assessment is carried out for each work process. For example, in the process "Opening the tailgate of a FFB transport truck" the process has a probability value (L) 2, namely an accident occurs once in 2-5 years and has a severity level value (S) 3, namely if an accident occurs a medical handler is needed and can cause loss of at most not 2 working days. The following table shows the results of hazard identification at the Loading Ramp station:

Table 4. Identification of potential hazards at the Loading Ramp station

No	Job Sequence	Potential hazard	Risk	Risk Assessment			Control Measures
				L	S	RK	
1	Opening the tailgate for the FFB transport truck	The worker is trapped in the tailgate of the FFB transporting truck	Hand fracture	2	3	M	Use gloves and door stoppers such as iron bars
2	Unloading FFB from trucks	FFB falls on workers from the back of the truck and workers can also be stabbed by FFB thorns	Blisters or wounds on the body	4	2	H	Use PPE such as safety helmets, safety clothing, safety shoes, and safety gloves
3	Examination of FFB under the storage tanks	Worker falls into pile of fresh fruit	Minor abrasions or cuts on the body	3	3	H	Make a danger sign in the area so workers will be more careful when doing work
4	Raise the fruit that is not good after the grading process into the truck bed	Workers can be stabbed with gancu	Wounds on limbs such as legs	1	3	M	Provide direction in the form of work risks that are likely to occur and suggestions to always use PPE for workers before carrying out work

Table 5. Risk Matrix at the Loading Ramp station

Risk Frequency	Risk Impact				
	1	2	3	4	5
5					
4		2			
3			3		
2			1		
1			4		

B. Identification of Potential Hazards at the Sterilizer Station

The steps at the Sterilizer station are:

- Workers open the door of the sterilizer and put FFB into the lorries
- Workers operate machines by applying steam pressure to the stretcher
- Opening the door of the sterilizer after the boiling process is finished
- The worker attaches the capstand rope to the hook at the bottom of the lorry
- Workers pull the lorry out onto the transfer carriage

Based on the process steps, a hazard risk assessment is carried out for each work process. For example, in the process "The worker opens the door of the sterilizer and puts the FFB into the lorry" the process has a probability value (L) 4, namely an accident occurs with a span of 2-10 months and has a severity level value (S) 2, namely if a minor injury occurs handled by the First Aid team only and/causing lost or less one working day. The following table shows the results of hazard identification at the Sterilizer station

Table 6. Identification of potential hazards at the Sterilizer station

No	Job Sequence	Potential hazard	Risk	Risk Assessment			Control Measures
				L	S	RK	
1	Workers open the door of the sterilizer and put FFB into the lorries	Workers are exposed to hot steam	Feeling of heat in the exposed limb	4	2	H	Wear PPE such as gloves, safety clothing and safety helmets
2	Workers operate machines by applying steam pressure to the stretcher.	The worker is electrocuted	convulsions	1	4	H	Make shock hazard signs/signs when the machine is in use and give instructions to workers to be more careful and always wear PPE
3	Opening the door of the sterilizer after the boiling process is finished	Workers are exposed to hot steam	Feeling of heat in the exposed limb	4	2	H	Use safety gloves, safety clothing and safety helmets
4	The worker attaches the capstand rope to the hook at the bottom of the lorry	Workers' hands are exposed to heat on the rails of the truck ends	Hot hands / can be scalded	4	2	H	Use safety gloves, safety clothing and safety helmets
5	Workers pull the lorry out onto the transfer carriage	Workers' hands can be injured by capstand ropes, slippery floors can make workers easily slip	The worker's hands are injured and can even be broken bones, sprained legs, can injure his head if he slips	4	4	E	Provide directions to workers to be more careful and always use PPE such as using safety gloves, safety clothes, safety shoes and safety helmets

Table 7. Risk Matrix at the Sterilizer station

Risk Frequency	Risk Impact				
	1	2	3	4	5
5					
4		1,3,4		5	
3					
2					
1				2	

C. Identification of Hazards at the Threser Station

The steps at the Thresher station are:

- Workers attach crane hosting ropes to the left and right sides of the lorry
- Workers operate the machine so that the lorry is lifted and transferred to the thresher machine
- The lorry is lifted from the transfer carriage floor to the thresher
- Workers pour the contents of the lorry into the thresher machine

Based on the process steps, a hazard risk assessment is carried out for each work process. For example, in the process "Workers install hosy crane ropes on each side of the lorry on the left and right" the process has a probability value (L) 4, namely an accident occurs with a span of 2-10 months and has a severity level value (S) 2, namely if an accident occurs minor injuries are enough to be handled by the first aid team alone and/or cause one working day lost or less. The following table shows the results of hazard identification at the Thresher station:

Table 8. Identification of potential hazards at the Thresher station

No	Job Sequence	Potential hazard	Risk	Risk Assessment			Control Measures
				L	S	RK	
1	Workers attach crane hosting ropes to the left and right sides of the lorry	Workers can be hit by the heat of the lorry when the crane's hosting rope is not properly attached	Injured hand	4	2	H	Use safety gloves, safety clothing and safety helmets
2	Workers operate the machine so that the lorry is lifted and transferred to the thresher machine	Workers can fall from the workplace	Broken bones, serious injuries	2	4	H	Provide direction in the form of work risks that are likely to occur and suggestions to always use PPE for workers before carrying out work
3	The lorry is lifted from the transfer carriage floor to the thresher	Fruit that has been boiled can fall on the workers below	Workers can get hot, burn, and die	2	5	E	Give directions to workers to be more careful and always wear PPE such as using safety gloves, safety clothes, safety shoes and safety helmets
4	Workers pour the contents of the lorry into the thresher machine	Fruit can befall workers	Heat impact	3	2	M	Give directions to workers to be more careful and always wear PPE such as using safety gloves, safety clothes, safety shoes and safety helmets

Table 9. Risk Matrix at the Thresher station

Risk Frequency	Risk Impact				
	1	2	3	4	5
5					
4		1			
3		4			
2				2	3
1					

V. Conclusion

Based on the discussion above, several conclusions can be drawn, namely:

1. There are several potential hazards found in the 3 areas analyzed at PT.KTS, namely at the Loading Ramp, Sterilizer, and Thresher stations. , fell into a pile of FFB, stabbed by gancu. The potential hazards at the Sterilizer Station are exposure to hot steam, electrocution, heat at the end of the lorry, getting injured by the capstand rope and slipping due to the slippery floor. Potential hazards at the Thresher station include being exposed to the heat of the lorry when unable to attach the rope hosting the crane, falling from the workplace, being crushed by fruit that has been boiled in a hot state.
2. Risk assessment based on the risk matrix table showed that the highest risk of potential hazard was at the Sterilizer station, where the worker's hand was injured by the capstand rope and the slippery floor made the worker slip, and at Thresher station, where boiled fruit was crushed which caused burns and could even cause workers to die.
3. Efforts to control this potential hazard risk can be carried out by holding internal outreach to company employees discussing risks in the workplace as well as discussions regarding occupational health and safety so that workers always use complete PPE at work.

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