DEVOTION
Journal of Research and Community Service
Volume 3, Number 12, October 2022
e-ISSN: 2797-6068 and p-ISSN: 2777-0915

ANALYSIS OF OCCUPATIONAL HEALTH AND SAFETY RISKS IN THE MANUFACTURING INDUSTRY WITH THE HIRARC METHOD AT PT. X

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KEYWORDS
Risk Analysis, K3, HIRARC (Hazard Identification, Risk Assessment, and Risk Control)

ABSTRACT

Batching plant is better known as a concrete processing plant, all of the tools are specially designed to mix or combine materials to form concrete. Sources of potential hazards that exist in the work environment are caused by the batching plant machine, the use of heavy equipment transportation, and office areas. The purpose of this study is to analyze the potential hazards that could occur in the work environment to carry out control or prevention at PT. X. This research was a quantitative descriptive study, to analyze occupational health and safety risks using the HIRARC method. The number of respondents was 4 people including management, SHE (Safety Health and Environment), and 2 operators of PT. X's batching plant. The variables of this research are risk identification, risk assessment, and risk control. The instruments used were observation, document review, and interviews using risk analysis guidelines with the HIRARC method. The results of this study indicate that the potential risks that could occur in the work environment include 14 work processes that could cause as many as 31 hazards with 42 potential hazards. The results of the research findings of hazard were grouped into 4 risk ratings, at a very high-risk rating there were 0 risks, at a high-risk rating there were 8 risks, at a medium risk rating there were 27 risks, and at a low-risk rating, there were 7 risks. Based on the result, it could be stated that this study, is the implementation of risk analysis using the HIRARC method as an effort to prevent potential hazards that could occur in the work environment at PT. X can be controlled by installing OHS signs, training workers, machine maintenance, maintaining the workplace/supervision at work, using equipment and working methods in safe conditions, providing PPE (masks, gloves, catelpak /vests, helmets, earmuffs/earplugs), involve competent workers to make a risk analysis with HIRARC

INTRODUCTION

Every environmental work contains potency and high danger so that requires something effort prevention and control so as not to occur accident work. Reason accident work is shared into five, that is man factor, tool/machine, material, method, and environment. Accident work could cause damage a member's body, and cause disease until death. Accident work could be sourced from several factors, such as factor ergonomics, environmental, chemical, and psychological (Wijaya, Panjaitan, & Palit, 2015).

Accident work by general caused by 2 things tree that is behavior hazardous work (unsafe human act) and dangerous conditions (unsafe conditions). one aspect of health and safety that must work noticed is disease consequence work (PAK). PAK is accepted risk worker in field health and safety work which is a consequence development industry in Indonesia and the increased power work (Thamrin, Ramadhani, Nadillah, & Ediwan, 2019).

Industry manufacturing is processing industry ingredient raw Becomes product half so nor product so, where in each withstand production processes and activities profession have risk from the dangers that exist. Industry manufacturing in 2020 has a high contribution in accident work together with the construction which is 63.6%. Accident work going on in the industry manufacture could of them happen because of management risk health and safety work in a company that doesn't hold with good. one effort to reduce or remove dangers that can cause accidents works on the spot work that is required something management risk (Susilowati et al., 2021).

Effort prevention accident work could be conducted with methods to identify the potency of existing risks. One of the methods used is Hazard Identification Risk Assessment and Risk Control (HIRARC) method. It is the HIRARC method that determines the direct application of K3 in something company so that company could complete the problem alone, especially problem OHS management in the company (Ihsan, Edwin, & Irawan, 2017).

PT. X is a company moving into industry manufacture that produces concrete ready wear. Potency danger to those who are environment PT. X is still not yet maximum in doing K3 management. Determination potency risk accident work is still not enough carried out at PT. X, with see condition environment still working not enough in monitoring, and analysis potential in the environment work still not yet maximum, and awareness worker still not enough in understanding K3 at the moment work.

See the existence potency of the dangers that exist in PT. X felt the need To analyze potential dangers that can happen on the spot purposeful work for knowing the danger that only those who are in the PT. X. Appropriate with Request from PT. X for help in analyzing potency dangers in the environment work. This thing was done so that researchers get information about the potency of the dangers in the environment work, so the researcher could do identification risk and assessment risks as well as could recommend controlling possible risks beneficial for the company at PT. X.

METHOD RESEARCH

Study this is study quantitative with a method of descriptive used to describe, explain, or summarize various conditions, situations, phenomena, or various variable studies according to the incident as anyone can be photographed, interviewed, observed, and what can be disclosed through materials documentary (Bungin, 2005). The data used is secondary data on potential dangers in environmental work to get analyze risk health and safety work in industry manufacture with the HIRARC method at PT. X.

Big the sample used in the study this as many as 4 respondents who have experience and are competent in destination research, selected respondents cover the manager, SHE (Safety Health and Environment), and 2 batching plant operators PT. X. Variable study this is identification risk assessment risk, control risk. Instruments performed are observation, study documents, and interviews using guidelines analysis risk with the HIRARC method

RESULTS AND DISCUSSION

Identification Results Health and Safety Risks to Industry Manufacture Work with HIRARC method at PT. X

The following table results in the identification of risk health and safety in industry manufacturing work with the HIRARC method at PT. X.

Table 1
Identification Results Risks in Batching Plant Machines at PT. X

Machine *Batching plant*			
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E
Batch	Use a ladder to the room	Fall from height	A
room/	control	slipped/slipped, Stumbled.	N
Room	Operation process *batching*	Voltage tall	A
control	*plant*	noise, dust, stress work	A
Hopper	Use a ladder to hopper	Slipped/fell to in hopper	E

Machine *Batching plant*			
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E
Batch	Use a ladder to the room	Fall from height	A
room/	control	slipped/slipped, Stumbled.	N
Room	Operation process *batching*	Voltage tall	A
control	*plant*	noise, dust, stress work	A
Hopper	Use a ladder to hopper	Slipped/fell to in hopper	E

Source: Secondary data of PT. X

Table 2
Identification Results Risks in Heavy Equipment Transportation at PT. X

Transportation Tool Heavy			
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E
Use *loader*	Car *loader* slipping	*Loaders* crash worker, Accident on the driver,	A
		Injuries, wounds,	N
	The textured floor (ground) is not enough congested so thatpotential collapse	*Loaders* rolled	A
		Loader crash too in the land, worker hit or pinched and fall from *loader*	N
Usetronton	crash	injury, injuries	N
		Die	E
	slip	tronton rolled	E
		injury, injuries	N
Use truck mixer	Process transfer concrete into the truck mixer	Potential spilled cement out, dirty environment profession	N
	crash vehicle other/workers' moment work	injury, injuries	N
		Die	E
	Caught smoke exhaust from truck mixer	Disturbance respiration	N

Source: Secondary data of PT. X

Table 3
Identification Results Risk in the Office Area at PT. X

Area office			
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk)*	Conditions _ _ _ N/A/E
Activity routine office	Condition floor dirty	Dirty and can influence activity work,	N
		disturbance breathing	N
	Use electricity	short circuit stung electricity, cause splash fire,	A
	ATK used	bring up rubbish	N
	Light is not enough bright	Decrease function eye	N
	Not enough drink	Disturbance kidney	A
	Ergonomics	Sick waist, cramps, tingling	N
Use computer	Radiation computer	Decrease function eye	N
	Ergonomics	Cramps on part of shoulder/ waist	N
	Use electricity	bring up current short, cause splash fire	A
	Cable scratch	Could sting electricity	A
Usage toilet	Usage electricity for lighting	bring up current short, stung electricity	A
	Floor slippery	Slip	N

Source: Secondary data of PT. X

Based on table 1, table 2, and table 3, in Thing, this identification of dangers in the environment work already To do identification danger in every environment work. Gunawan discloses that Identification danger is something effort systematic to know the existence of potency dangerous environment work. If the properties and characteristics could is known, then could watch out as well as To do control so as not to cause accident work. At PT. X highest danger the risk found in section operation batching plant machine and operation transportation tool weight (Gunawan, 2015).

This thing in line with research conducted by Santoso states that a level of knowledge about danger is very important for applying health and safety work to prevent happening accident work nor disease consequences work (Indrayani et al., 2022). Whereas according to Ramli's method best for identifying danger is with the method proactive which is to look for danger before danger cause consequence or adverse effects (Ramli, 2010).

Identification Results Evaluation Health and Safety Risks to Industry Manufacture Work with HIRARC method at PT. X

The following table results in the identification evaluation risk health and safety in industry manufacturing work with the HIRARC method at PT. X:

Table 4
Assessment Results Risks on Batching Plant Machines with HIRARC method at PT. X

Machine *Batching Plant*						
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E	Kemung kinan (*Likelih ood)*	badan (*Severity*)	*risk* Rating
Batch room/ Room	the of the Use a ladderto room control	Fall from height	A	2	3	*Medium*
		slipped/slipped, Stumbled.	N	3	1	Low
control	Process operation *batching plant*	Voltage tall	A	2	5	High
		Noise, dust, work stress	A	5	3	High
Hopper	Use ladder to hopper	Slipped/fell to in the hopper	E	1	5	High
	Process checking material	hit by material/hit material splash	N	2	2	Low
		Get hit by the loader	N	1	4	Medium
		Noise, dust	A	5	2	High
Pan mixer	Checking process mixing material	slipped/slipped, splash batter concrete	N	3	1	Low
		Fall into the mixer machine	E	1	5	High
Tube silo	Tube hosemiss	Cement is scattered in the environment, and can influence the function breathing	A	1	3	Medium
	Use ladder in tube silo	Fall from altitude, slip	A	2	3	Medium
The place material	Process transfer material	Hit by material, dust	A	2	3	Medium
person/ chutes	Transfer process material from funnel to truck mixer	Dust, funnel clogged, spilled material about worker	N	2	3	Medium
	Mixing water	Too lots of water, less water	N	3	1	Low
Admix tour	Use ingredient addition chemical	Irritation of skin, disorder breathing, Nausea/vomiting	A	1	3	Medium
Conveyor	Transfer aggregate to in mixer loading	Conveyor broke	A	1	4	Medium

Source: Primary data of PT. X

Table 5
Assessment Results Risks in Heavy Equipment Transportation with HIRARC method at PT. X

Transportation Tool Heavy						
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E	maybeinan (*Likelihood)*	bada (*Severity*)	*risk* Rating
Use *loader*	*loader* car slipping	*Loader* crashing worker, accident on driver,	A	1	3	*Medium*
		Injuries, wounds,	N	2	3	*Medium*
	The textured floor(ground) is not enough congested so thatpotential collapse	*Loaders* rolled	A	1	4	*Medium*
		Loaders collapse to land, workers are hit or pinched and fall from the *loader*	N	2	3	*Medium*
Use tronton	crash	injury, injuries	N	2	3	*Medium*
		Die	E	1	5	High
	slip	tronton rolled	E	1	5	High
Transportation Tool Heavy						
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (Condition) N/A/E	maybeinan (*Likelihood)*	bad a (Severity)	*risk* Rating
		injury, injuries	N	2	3	*Medium*
Use truck mixer	Process transfer concrete to In the truckmixer	Potential spilled cement out, dirty environment profession	N	4	1	*Medium*
	crash vehicle other/ workers moment work	injury, injuries	N	2	3	*Medium*
		Die	E	2	5	High
	Exposed to smoke exhaust fromthetruck mixer	Disturbance breathing	N	4	1	*Medium*

Source: Primary data of PT. X

Table 6
Assessment Results Risks in the Office Area with HIRARC method at PT. X

Area office						
Process (*Processed*)	Danger (*Hazard*)	Risk (*Risk*)	Condition (*Condition*) N/A/E	maybeinan (*Likelihood)*	badan (*Severity*)	*risk* Rating
Activity routine office	Floor condition dirty	Dirty and can influence activity work,	N	5	1	*Medium*
		disturbance breathing	N	3	2	*Medium*
	Use electricit	Short circuit, stung electricity,	A	2	3	*Medium*

	y	generate splash fire,				
	ATK used	bring up rubbish	N	5	1	*Medium*
	Low light bright	Decrease function eye	N	2	1	Low
	Not enough drink	Disturbance kidney	A	1	3	*Medium*
	Ergonomics	Sick waist, cramps, tingling	N	5	1	*Medium*
Usage n computer	Radiation computer	Decrease function eye	N	2	1	Low
	Ergonomics	Cramps on the part shoulder/ waist	N	5	1	*Medium*
	Use electricity	Generating current short, causesplash fire	A	2	2	Low
	Cable scratch	Could sting electricity	A	2	3	*Medium*
Usage toilet	Usage electricity for lighting	Generating current short, stinging electricity	A	2	3	*Medium*
	Floor slippery	Slip	N	5	1	*Medium*

Source: Primary data of PT. X

seen evaluation risk from potential - potential danger before. Rating results risk of 42 potential danger risks in the environment PT. X counts use semi- quantitative way based on AS/NZ 4360 results multiplication Among likelihood (likelihood) and severity (saverity) that has been determined level possible risks happen. The result of identification risk is 14 work processes that can cause 31 dangers with 42 potential risks that can occur grouped into 4 risk ratings. At a very high-risk rating, there are 0 risks, at a high-risk rating there are 8 risks, at a medium risk rating there are 27 risks, and at a low-risk rating, there are 7 risks (Sanchez, Robert, Bourgault, & Pellerin, 2009).

Compilation Effort Control Health and Safety Risks to Industry Manufacture Work with HIRARC method at PT. X

Control risk based on a hierarchy of control at PT. X after conducting identification risk and assessment risk on each source danger include:

1. Manipulation engineering (engineering control)

   According to the ILO, one of the HIRARC controls risk is manipulation engineering, control this conducted aims to separate danger from the worker as well as to prevent happening error human. The company already Does manipulation techniques like installing anti-radiation glass on the computer monitor to reduce radiation direct from the computer.

2. Administration

   Administration control is the control risk with the change method (Tarwaka, n.d.). Control this already implemented by the company namely:

   a. Installation K3 signs

      Control carried out with installing K3 signs are posted signs at work/project, use remind or identify all executor activities around the place the to conditions, associated risks with health and safety each other's work (Nur, 2019). PT. X has to control risk with install several K3 signs on the spot work as a ban approached in the batching plant machine area with a limited distance certain, warning voltage high, and warning to Be careful in work areas that contain potency danger.

According to the Law of the Republic of Indonesia No. 1 of 1970 concerning K3 signs in Article 14 b mentions businessmen are Required to install K3 signs on the spot work and in places that are easy to see and read and demand instruction from employee supervisors or expert safety work. Control this by PP RI No. 50 of 2012 concerning System OHS management audit criteria 6.4.4 states K3 signs must be installed by standards and guidelines technical.

b. Worker Training

According to (Gomer et al., 1997) training is every effort to repair performance work in a profession certain that are Becomes not quite enough he answered. Control administration worker training has not yet been implemented by the company. This thing is not yet by PP RI No. 50 of 2012 about System OHS Management in Thing development skills and abilities.

c. Machine maintenance

Maintenance machine is action purposeful maintenance prevent happening prone damage the damage has is known or could estimate before. Care or maintenance is a form of activity carried out to reach a result that returns an item or keeps it in a constant state and could function (Maria Ulfa et.al, 2021). This thing by PP RI No. 50 of 2012 concerning System OHS Management 6.5.4 in Thing inspection, maintenance, care, repair, and any change must conduct by competent and authorized officers.

d. Conditioning the place work / on-site supervision work, use equipment and methods work in a condition safe

From the result study data document in the work area of PT. X control administration Conditioning the place of work, use of equipment, and methods work in a condition safe, already implemented by the company can see the operating process already conducted with existing work SOPs.

This thing by PP RI No. 50 of 2012 Article 19 Paragraph 1 in Thing institution builder sector effort could do SMK3 supervision of the implementation of the developed SMK3 by provision regulation legislation. And in PP RI No. 50 of 2012 concerning System OHS Management 7.1.1 in Thing inspection/inspection to the place work and how work is held regularly.

3. PPE

Using tool protector self is alternative ultimate control after control previously no could apply. The use of PPE is not to prevent an accident but to reduce the impact or consequence of something incident (8). PPE control is carried out with provide tool protector self by the functions and hazards that exist in each work area, PPE such as masks, gloves hand, vests / katelpak, and helmets.

This thing by Law No. 1 of 1970 concerning safety work Chapter 10 Article 14. However, the usage of the tool protector self still does not have enough discipline, thing which is not yet by Law No. 1 of 1970 concerning safety work Chapter 8 chapter 12 regarding obligations and rights power work for use tool protector required self.

CONCLUSION

Based on the results research conducted could conclude that results identify the potency of the danger describe activity work at PT. X by general 14 work processes can because 31 dangers with 42 potential risks to the work process. From

42 potential risk dangers that can occur grouped into 4 risk ratings. In the very high-risk rating, there are 0 risks, the high-risk rating has 8 risks, the medium risk rating has

27 risks, and the low-risk rating has 7 risks. Control possible risks carried out by PT. X covers the installation of K3 signs, training for workers, machine maintenance, conditioning the place work / on-site supervision work, use of equipment and methods work in a condition safe, provision of PPE (masks, gloves) hand, katelpak / vest, helmet, ear plug).

Suggestions that can be given by researchers for workers who have knowing the potency danger expected could maintain and continue to increase it, while for workers who have not known or not enough understand Keep going upgrade one with method notice superior moment existence appeal about potency possible risks happens, with so will add outlook to potency possible risks happening in the environment work so that could minimize happening accident work and illness consequence work.

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