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ORIGINAL ARTICLE

Risk Management in The Packaging Unit at Animal Feed Industry Sidoarjo, Indonesia

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ABSTRACT

Introduction: Animal feed industry Sidoarjo is one of the companies in the animal feed manufacturing industry. The packaging unit is the last unit in the production process that packs the feed ingredients and arranges the finished goods. A location with the most safety hazards based on the work accident reports for 2010-2017 is in the packaging unit as many as 15.78%. The purpose of this research is to analyze the risk management of work safety in the packaging unit of animal feed industry Sidoarjo. **Methods:** Based on the data collection method, this research was included in observational research with a cross-sectional design. The subjects in this research were workers (37 people) in the animal feed packaging and the Health Safety Environment (HSE) units. The research was conducted at the packaging unit of Animaal Feed Industry, Sidoarjo, Indonesia in November 2019-June 2020. **Results:** Based on hazard identification, there were 15 hazards with a risk analysis of 53% moderate risk and 47% high risk. The risk evaluation obtained was including 53% tolerable risk and 47% intolerable risk. After controlling efforts, there was a decrease in the risk category. **Conclusion:** The residual risk obtained after controlling carried out experienced a reduction of moderate risk by 100% and high risk by 71%. The remaining risk was 33% moderate risk and 13% high risk.

Keywords: animal feed packaging, risk management, work accident

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INTRODUCTION

The industrial sector in Indonesia is currently developing rapidly; however, the number of work accidents increases along with the increasing number of industries in Indonesia. According to BPJS Ketenagakerjaan (2019), work accidents that occurred in 2017 amounted to 123,041 cases, and in 2018 there was an increase to 173,105 cases. According to the International Labour Organization (2018), an estimated 2.78 million workers die every year due to occupational accidents and occupational diseases. About 2.4 million (86.3%) of the deaths were due to occupational diseases, while more than 380,000 (13.7%) were due to occupational accidents.

Each year, there are nearly a thousand non-fatal occupational accidents compared to fatal occupational accidents. According to Djatmiko (2016), work accidents are caused by unsafe actions and unsafe conditions. Personal factors are one of the factors that affect unsafe action, such as inattention, being careless, or rushing to do work which then can cause work accidents (Wong *et al*., 2018). Work accidents also can be caused by machines or equipment used, usually on jamming, cutting, and crushing (Kim, Lee and Kang, 2021). Work accidents can be prevented as early as possible based on the potential and nature of a job so the losses that occur are not too large or can be minimized (Djatmiko, 2016).

Risk management is one of the efforts that can be carried out to prevent work accidents. According to Ramli (2010), risk management is an effort to manage OHS risks preventing accidents or other undesirable things in a system. The risk management approach is carried out based on a flowchart that links risk analysis, risk-transparency reporting, then the transparency reporting is used in making risk management decisions which will be used to implement risk management (Lathrop and Ezell, 2017). Research related to occupational safety

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risk management in the industry by Novandhini, Mahfudz and Paskarini (2020) shows a significantly reduced risk after risk control is carried out.

Another research conducted by Sari and Wahyudiono (2020) shows a reduced risk of two hazards by moderate into a low category. Risk management starts from the risk identification in the workplace, analysis, and evaluation to assess the level of risk that is tolerated and not. The next step is scoring of risk control that has been implemented by the company. A residual risk scoring aims to determine the remaining risks after the control is carried out. The results of residual risk scoring will be used as a guide for future control efforts. By implementing risk management, it can reduce the risk of hazards that cause work accidents so the company productivity can increase.

Sidoarjo animal feed industry is a manufacturing company of animal feed. Each work step in the animal feed industry has different potential hazards that may lead to work accidents. The animal feed production process in Sidoarjo has several stages in each unit, such as intake, extruding, intake premix, hand adds, mixing, palleting and packing. Work accidents in the animal feed industry from 2010 to 2017 had safety hazards of 97.4% compared to health hazards of 2.56%. The safety hazards with the most number are mechanical. The fatality rate in the animal feed industry in 2010-2017 for safety hazards is higher than health hazards.

A location with the most safety hazards based on the work accident reports for 2010-2017 is in the packaging unit as many as 15.78%. The packaging unit is the last unit in the production process that packs the feed ingredients and arranges the finished goods. According to previous research at this animal feed industry with different locations by Ihsan, Edwin and Irawan (2016), as many as seven sub¬divisions are at a low risk level (78%), while the other two sub-divisions, namely foam cutting and finishing stages, are at moderate risk level (22%). There are four causes of accidents analyzed: the attitude of labor, material and equipment, working environment and working procedures. Risk control can be done with the engineering, administrative controls, and the use of personal protective equipment.

METHODS

Based on the data collection method, this research was included in observational research with a cross-sectional design. The subjects in this research were workers (37 people) in the animal feed packaging and the Health Safety Environment (HSE) units. The research was conducted at the packaging unit of animal feed industry, Sidoarjo, Indonesia in November 2019-June 2020. The variables in the research were the hazard identification originating from mechanical, hazard risk analysis, risk evaluation, risk, and residual risk control. The data used were primary data and secondary data.

Primary data were obtained directly from interviews and observations. Interviews were conducted using an interview guide from Australia Standards/New Zealand Standards (2009) to determine the hazards, risks, and controls carried out. Observations were carried out using the Hazard Identification Risk Assessment, Determining Control (HIRADC) observation sheet to observe the packaging unit's work process and environmental conditions. Meanwhile, secondary data were obtained from work accident data that had occurred at animal feed industry Sidoarjo in 2010-2017 and 2018 HIRARC documents. This research has been approved by the institutional Ethical Board of The Faculty of Public Health, Airlangga University Surabaya with a certificate of ethics number 11/EA/KEPK/2020.

Hazards Identification

Hazard identification was carried out by processing the results of interviews and observations into HIRARC tables. Interviews were conducted with workers and HSE regarding the hazards involved in the work process of the packaging unit. The results of the interview were then reconfirmed with the 2018 HIRARC document to match the interview answers.

Table 1. Frequency Category

Score	Explanation
5	Almost certain, very likely or very frequent. Occurs > once a week
4	Likely, most likely, but not a continuous occurrence. Has happened > once a month
3	Possible, can happen once in a while. Has happened 6-12 times a year
2	Unlikely, not expected to happen, but it is possible. A rare occurrence. Occurs 1-5 times a year
1	Rare, very unlikely will happen. It happens very rarely. It happened once a year

Source: Risk Management Guidlines Companion to AS/NZS 4360:2004

Risk Analysis

Risk analysis used semi-quantitative methods. The frequency and consequence assessment was based on interviews and accident data. If accident data were not available, HSE and workers would be asked then proved by observation.

The frequency and consequence category referred to the AS / NZS 4360: 2004 risk scoring matrix. After obtaining the frequency and consequence, risk scoring was carried out using a risk matrix. The scoring was calculated using the formula: ***Risk score = frequency x consequence.***

Table 2. . Consequence Category

Score	Explanation
5	Severe, serious injury, lost work days >3 months, death of more than one person
4	Major, serious injury, lost work days >2-≤3 months, single death and/or severe irreversible disability for one or more persons
3	Moderate, moderate injury, requires medical attention, lost work days >1 week - ≤2 months, irreparable moderate disability or damage for one or more people
2	Minor, minor injuries can be performed first aid, objective but reversible disability requiring ≤ 1 week of hospitalization
1	Negligible, no injury, no medical treatment required

Source: Risk Management Guidlines Companion to AS/NZS 4360:2004

Table 3. Risk Matrix

Frequency	Concequence				
	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Source: Risk Management Guidlines Companion to AS/NZS 4360:2004

Table 4. Risk Scoring Category

Score	Explanation
20 – 25	Very high risk, immediate action and response is required, a management assessment and plan are required
9 – 16	High risk, require attention and handling by company management or departments
5 – 8	Medium risk, need additional control, supervision and monitoring by the area or division manager
1 – 4	Low risk, can be managed by routine procedures, reported to the local supervisor

Source: Risk Management Guidlines Companion to AS/NZS 4360:2004

Risk Evaluation

Risk evaluation was carried out based on the results of a risk scoring according to the concept of As Low As Reasonably Practicable (ALARP). Risk evaluation was used to determine risk priorities and also to determine whether the risk is acceptable or not.

Risk Control

Risk control was carried out to reduce high and moderate risks. The control effort that had been carried out can be obtained based on interviews and observations of HSE and employees. To assess the

Table 5. Risk Acceptance Level

Risk Score	Explanation
12 – 25	Intolerable risk
5 – 10	Tolerable risk
1 – 4	Acceptable risk

Source: Risk Management Guidlines Companion to AS/NZS 4360:2004

Table 6. Categories of Control Effectiveness

Score	Explanation
100%	Special, control requirements are fully implemented and functional
90%	Very good, controls are implemented and functioning but need to be improved
75%	Well-implemented, controls are implemented and functioning but there are gaps that need fixing
65%	Implemented, implemented fairly well but requires specific action and focus to meet the requirements
50%	Half implemented, implemented to some extent, specific actions need to be planned and implemented
40%	Implemented by < 50%, there are obvious gaps or gaps and there is the possibility of misunderstanding some of the specific actions that still need to be taken
25%	Implemented weakly, no concrete action has been taken to implement the requirements, requiring specific interventions to ensure progress is made to implement the requirements
15%	There is a sense that action must be taken but nothing has been done to implement the controls
0%	Not implemented, nothing was done and no implementation considerations in the near future

Source: (Siswanto, 2009).

risk control that had been carried out, it was based on the criteria as in the table. The control assessment categories are presented in Table 6 to determine how effective controls can reduce the risk.

Residual Risk

The residual risk was carried out aimed to know the remaining risk from the control efforts that had been carried out. The residual risk score was obtained from the calculation of the residual risk and then categorized to see residual risk level.

$$\text{Residual Risk} = \frac{(100\% - \%\ ControlScore)}{100\%} \text{x Initial Risk}$$

The calculation of the score of the residual risk is calculated using the formula:

Risk analysis was carried out using a semi-quantitative method by displaying the likelihood and severity of risks in a numerical form so that calculations could be made. The results of the risk scoring calculations were then carried out with a descriptive analysis based on the literature.

Table 7. Results of Hazards Identification, Risk Analysis, Risk Evaluation, Risk and Residual Risk Control Scoring at Packaging Unit of Animal Feed Industry Sidoarjo

Risk Identification			Risk Analysis			Risk Evaluation	Risk Control Scoring	Residual Risk
Work Process	Source of Hazards	Hazards	F	C	Risk Score			
Take out the sack from storage	Scattered equipment or feed products	Feet tripped by equipment	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
		Slipped by feed ingredients on the floor	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
Put the sacks from the floor to the table	Scattered items or sacks	Slipped by sack	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
		Tripped over a pile of sacks	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
Fill the sacks with feed products	Machine position which equivalents to the head	Head hit the machine	2	5	10 (High risk)	Intolarable risk	40%	6 (Medium risk)
	High chair position	Fall off the bench	2	5	10 (High risk)	Intolarable risk	40%	6 (Medium risk)
	Not being careful when attaching the sack to the machine	Fingers pinched by machine and sack	3	5	15 (High risk)	Intolerable risk	40%	6 (Medium risk)
Sew sacks that are filled with feed	Frequent machine troubles	Fingers sewn by machine	2	4	8 (Medium risk)	Tolerable risk	65%	3 (Low risk)
		Fingers pinched by machine	2	4	8 (Medium risk)	Tolerable risk	65%	3 (Low risk)
	Workers that are less careful	Fingers pinched by machine	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
		Hands pinched by machine	2	4	8 (Medium risk)	Tolerable risk	50%	4 (Low risk)
	Machine position above the arranging worker	Crushed by filled sacks	3	5	15 (High risk)	Intolerable risk	40%	9 (Medium risk)
Arrange sacks onto pallets	Not being careful when arranging	Fall between the small gaps in the pile of sacks	4	3	12 (High risk)	Intolerable risk	25%	9 (Medium risk)
		Fall while pulling the adjoined leg	3	5	15 (High risk)	Intolerable risk	25%	12 (High risk)
		Feet crushed by sacks	5	3	15 (High risk)	Intolerable risk	25%	12 (High risk)

RESULTS

Animal feed industry Sidoarjo is an industry engaged in animal feed processing, the product produced is animal feed for poultry consumption, which has pellet (cylinder) and crumble (granular) product forms. The quality management system implemented was the ISO 9000 series quality management system and the environmental management system, namely the ISO 14000 series. The purpose of implementing ISO 9000 was to ensure a quality and consistent production process. ISO 14000 series aimed to reduce the environmental damage caused by the company's production process. The production process had ten stages, including intake, grinding or hammer mill, extrusion, hand add, mixing, call spray, pelletizing, cooling, crumbling, and packing. In this company, the OHS policies implemented were OHSMS (Occupational Health and Safety Management System).

The implementation of OHSMS had not been well-applied because there were work accidents that occurred in the company, causing the company to suffer losses of time and costs. One of the important things to support the implementation of OHSMS was the HIRARC documents. Meanwhile, HIRARC documents needed to be reviewed and updated regarding the potential hazards in each production area because they had not been detailed in examining and identifying the hazards that existed at the time. OHS policies carried out by companies in implementing OHSMS were the availability of PPE (Personal Protective Equipment), safety signs in production and non-production areas, also other safety equipment such as fire extinguishers. The main aim of the standard operating procedure is to protect and increase the work health and safety. Therefore, avoiding any work accidents due to work risks. This includes the control of emission and waste as well as monitoring the work safety continuously. PT X demanded the full commitment from all the workers, contractors as well as manager and supervisor in implementing the work safety hazards.

Table 7 shows the results of hazard identification, risk analysis, risk evaluation, risk and residual risk control scoring contained in the animal feed packaging unit of animal deed industry Sidoarjo. Hazard identification at packaging unit of animal feed industry Sidoarjo was carried out using the HIRARC technique. There were five work steps in the packaging unit with various hazards, namely taking sacks from storage, placing sacks from floor to table, filling sacks with feed products, sewing sacks that filled with feed, and arranging sacks onto pallets. The five work steps carried out a risk analysis using the AS / NZS 4360: 2004 method. The risk analysis result was there were eight moderate risks (53%) and seven high risks (47%) in the packaging unit. Then a risk evaluation was carried out based on the concept of As Low As Reasonably Practicable (ALARP).

The packaging unit's risk evaluation outcome showed seven risks (47%) that fall into the unacceptable category and eight risks (53%) fall into the acceptable category. The results of residual risk assessment showed that there are eight low risks (53%), five moderate risks (33%), and two high risks (13%), the magnitude of these percentages indicates a reduction in high to moderate risk by 33% and moderate to low risk by 100%. The percentages indicate that risk control in the packaging unit can reduce the risk of being tolerable or acceptable. However, there are still two risks in the category, such as high risk which is 29%

DISCUSSION

At the packaging unit of animal feed industry Sidoarjo, there were five work processes with various potential hazards. The work processes of the packaging unit mostly use a machine and human performance, so the most common hazards are safety hazards, especially mechanical hazards such as being pinched, fallen, tripped, hit by a machine, slipped, sewn, and crushed. This indicates that workers in packaging units are at greater risk of having work accidents that cause injury or injury.

Risk analysis is carried out based on AN/NZS 2004, namely with a semi-quantitative approach. Risk analysis is the backbone of a risk management plan because, at this stage, it is used to determine which interventions will be carried out in dealing with existing risks (George, 2018). The risk analysis shows that there are seven potential hazards in the packaging unit with high category risk (47%) and eight with medium category risk (53%). In the previous packaging unit, hazard identification and risk analysis had been carried out, but it was not detailed enough to identify new hazards so that many small hazards were not reported.

Based on the ALARP concept, intolerable risk requires more priority treatment so that it is categorized as acceptable (acceptable risk) or tolerable (tolerable risk). After a risk evaluation

is carried out, it is necessary to control high risks and moderate risks to reduce risks. Risk evaluation shows high risk and medium risk have priority in risk control because hazards in the workplace must be eliminated and controlled to keep them as low as possible to minimize the occurrence of work accidents (Rout and Sikdar, 2017). Based on interviews, risk control can be carried out to reduce the risk to an acceptable risk or tolerable risk by workers. Risks that are in the red zone must be prevented by reducing the possibilities, reducing the severity, diverting or avoiding. Meanwhile, in the yellow zone, efforts are made to reduce the risk until it is acceptable (acceptable risk) by workers (Ramli, 2010).

Risk control that has been carried out in the packaging unit was administrative control and control of personal protective equipment (PPE). Risk control that has been carried out in the packaging unit based on the hierarchy of controls is administrative control and PPE. The administrative approach is taken to reduce mechanical hazards, including inspection of equipment and machines by maintenance, work inspections by foremen, OHS briefings, job rotation, job training, and the existence of SOPs for every activity in the packaging unit. Machine inspections by maintenance are carried out regularly every week so that equipment and machines that are damaged can be repaired immediately. Work inspection by foreman is carried out by reprimanding or giving a warning to workers who do not work according to the SOP. PPE used in the packaging unit includes shoes, masks, hairnets, and uniforms in the form of t-shirts and training pants.

According to Izudi *et al*. (2017) , there is a significant relationship between job training and employee performance. The low use of PPE confims previous evidence that showed high occupational injuries and fatal accidents in the construction industry. That study indicates that prior knowledge of safety measures increased use of PPE. Essentially, ignorance and inadequate health and safety information are dual factors that contribute substantially to poor safety practices at construction sites. Earlier, lack of safety training affcted use of PPE.

High Risk

Head Collision

A head collision can cause injuries, bumps, dizziness to a concussion, paralysis, and serious head injuries. The level of frequency of this hazard is 2 with a severity of 5 or severe so that the hazard of a head collision is included in the high-risk category with risk evaluation according to ALARP being an intolerable risk.

Head collision is a hazard that exists in the working process of filling the feed product into the sack because the machine is positioned on the same level as the worker's head. Because the position of the machine and the head are parallel, if the worker forgets his position, he will likely hit the machine. Improper position or design of equipment is a work factor that allows work accidents to occur (Tarwaka, 2017).

Administrative control is carried out by routine inspections of the work process by foreman, if anything unsuitable is found it will be reported. According to Betsis *et al*. (2019) conducting more frequent inspections along with the management's dedication of occupational health and safety can reduce the number and severity of work accidents. PPE control in the form of hairnet usage is also carried out. In PPE control, the use of hairnet is deemed inappropriate, the head protector used should be a safety helmet. The assessment of the risk control that has been carried out is 40% because it has been done the use of PPE but there are still gaps that require specific actions then because there is no documentation of findings during work process inspections.

The residual risk after controlling is 6, which is included in the tolerable category. To maximize the risk reduction, the effort could be further improved by conducting routine and scheduled inspections, educating the workers on the importance of using PPE. Inspection is the best way to assess the problems remaining on the field, as well as the risk before work losses or accidents and occupational injuries occur.

Fell off The Bench

The hazards of falling off the bench are inherent in the work process of filling the sacks with feed products. This activity is carried out using a machine that is 1.5 meters high. In carrying out these activities, workers use a 1-meter high bench to equalize the position of the hands with the machines used, so that it can cause a hazard of workers falling from a height. Falling can pose a risk of injury, concussion, fainting, back pain, and paralysis. The frequency level of this hazard is 2 with a severity of 5 or severe so that, based on the ALARP category,

the hazard falls into the intolerable risk category. Administrative control is carried out, namely routine inspection of the work process; if it is not suitable then it will be reported. PPE control is also carried out, namely by providing a hairnet, shoes, and masks.

The results of this research are in accordance with previous research that the administrative control could further reduce the risk of falling off the bench. This should be done by safety briefing, supervision and the provisions of work instructions as well as easy access on first aid kits and clinic. Examining the bench regularly to check on its stability should be included in the safety assessment (Novandhini, Mahfudz and Paskarini, 2020).

The control assessment obtained was 40% because the PPE used was complete, but required specific actions such as documenting the location. The remaining risk assessment is 6 with the moderate risk category. More explicit action is needed against employees who still do not use work protective equipment while working with verbal or written reprimands. So that it can create employees who are obedient and caring for work safety by using personal protective equipment while working (Fatimah, Nurwijayanti and Farida, 2019).

Pinned Finger

The risks that arise from this hazard are injury to cracks in the finger bones. The level of frequency of this hazard is 5 with a severity of 3 or moderate so that the hazard is included in the high-risk category and the risk evaluation shows the category of intolerable risk. Administrative control is carried out by inspecting the work process, namely by reprimanding workers who work carelessly. PPE control is also carried out using shoes, hairnet, masks, and uniforms, but based on observations there are still many workers who do not use PPE as recommended by HSE.

The hazard of a finger being caught between the machine and the sack often happens in the working step of filling the sack with feed products. The sack will be attached to the filling machine for 50 kg of feed filling and in the installation; the sacks must be tightly attached to the engine parts. In this work process, several workers chat with their co-workers, so that the worker lose their focus and decrease their concentration and alertness. Human factors such as lack of attention, carelessness, or rushing, can cause work accidents (Wong *et al*., 2018).

The control evaluation obtained is 40%; it is necessary to do several things such as implementation related to documentation, socialization related to the use of PPE, and the importance of obeying regulations. The residual risk to this hazard is already reduced to moderate risk. According to Pasaribu, the PPE should be further evaluated to assess the protection as well as the mobility. The main reason the workers do not wear the PPE is that they consider the equipment are not comfortable or are 'reducing the productivity.' Therefore, the effectivity of the PPE should be further assessed (Pasaribu, 2020).

Crushed by Sacks

The hazard of being crushed by a sack is in the work process of arranging sacks that have been filled on the pallet. The hazard is caused by the machine that is positioned above the worker who does the palletizing so that workers do not know when the sack arrives and there is a possibility that the sack falls on the worker. Risks that can arise from these hazards include bruises on the body, headaches, concussions to paralysis. The level of frequency of this hazard is 3 with a severity of 5 or severe, so it is included in the high-risk category and risk evaluation is included in intolerable risk. Administrative control is carried out by routine inspections, while PPE control is carried out by workers using a hairnet.

The company is required to reduce the risk not just by providing PPE and the standard operating procedure of using the PPE but also installing a clear sign on where should the workers stand and not stand, in order to prevent workers from standing on the risk area (Sari and Wahyudiono, 2020). The possible control of techniques is to resizzle the workplace (Mehrdad, Dennerlein and Morshedizadeh, 2012) .

The risk control assessment is 40% because it requires documentation and the use of a hairnet should be replaced with a safety helmet. The assessment related to the misusage of PPE right now tends to be ignored because they prioritize things that look like work accidents (Ammad *et al*., 2021). According to Tadesse and Israel (2016), more than three fquarters of the employees did not use PPE during work. This may signify that there was poor provision of PPE from employers, and lack of awareness about its importance by the workers. As a recommendation, it is imperative that safety programs need to pay more attention to provision and use of PPE.

Slipping

Slipping is a hazard in the working process of sack arrangement on pallets. This hazard is caused by workers being careless and unaware that there is a hole around 20-30 cm in diameter between the pile of sacks so that the workers' feet can slip into the hole. The risks that arise from this hazard are sprained, injured, and swollen feet. The level of frequency of the hidden hazard is 4 with a severity value of 3 or moderate, so it is included in the high category risk and the risk evaluation obtained is intolerable risk. Administrative control is carried out with working inspections done by the foreman, and PPE control is carried out by providing ordinary shoes. Based on observations, many workers who do not use the PPE shoes said they feel uncomfortable. Moreover, the quality of the shoes deteriorates quickly and the procurement that should be given once a year experiences delays. The appropriate PPE to control hazards is safety shoes; the use of safety shoes aims to avoid injury during industrial accidents. In addition, it is also used as a long-term prevention of the muscculoskellatal system of workers (Ochsmann *et al*., 2016). The control assessment is 25% because it still requires special intervention and provides more comfortable PPE for workers, the residual risk is decreased to the medium category.

Foot Crushed by Sacks

This hazard is found in the work process of sack arrangement on a pallet. Based on interviews with workers, this hazard is caused by the position of the machine above the worker's head and also the lack of caution when arranging the sacks on a pallet. The risks that this hazard can pose are sprained legs, bruises, swelling, and fractures. The level of frequency of this hazard is 5 with a severity level of 3, so this hazard is included in the high-risk category and the risk evaluation shows it is included in the intolerable risk category. Administrative control is carried out by the foreman inspecting and giving a warning if the worker does something that is not appropriate. Engineering controls, substitution and administrative controls are more effective methods that not depend on workers behavior. As a recommendation, safety programs need more attention to provision and use of PPE (Ajayi *et al*., 2021).

The control assessment obtained is 25% because it requires more specific intervention, the residual risk is still in the high-risk category, and requires further review. Just like the previous risks assessment, installing a clear sign on where should the workers stand and not stand, in order to prevent workers from standing on the risk area should be done as well as regular assessment and supervision on the discipline of the workers regarding the use of PPE (Sari and Wahyudiono, 2020).

Fell while Pulling Slipped Feet

This hazard is found in the work process of sack arrangement on a pallet, when the workers' feet slip into the holes, the workers will try to pull their feet and that can cause the workers to fall when their position is unbalanced. The risks that arise from this hazard are fainting, injury to the spine, concussion to paralysis. The level of frequency of this hazard is 3 with a severity of 5 so that this hazard is included in the high-risk category and the risk evaluation is intolerable risk. Administrative control carried out is a work inspection by the foreman, and PPE control is carried out by providing ordinary shoes. But still many workers do not use shoes because they feel uncomfortable and the quality of the shoes given quickly breaks down. Procurement that should be done once a year is delayed. Inadequate use of PPE can lead to work accidents, for example, the absence of safety shoes can cause the feet to be exposed to hard surfaces or sharp objects such as nails (Khan *et al*., 2019).

The risk control assessment is 25%, indicating that special intervention is still needed. The residual risk indicates that it is still in the high-risk category. Further safety improvement should be done by installing clear sign regarding the risky floor. Also, a regular review to check whether the control has been carried out effectively. Also educating the workers on how to do first aid help during accidents (Sari and Wahyudiono, 2020).

Medium Risk

Tripping

Tripping hazards exist in the working process of taking sacks from storage to the packaging department. This hazard is caused by a large number of scattered equipment or feed products so that workers are disturbed. If the worker does not see the item, it is possible to trip over it. Tripping hazards also exist in the work process of placing the sacks from floor to table which is caused by a pile of sacks

that disturbs workers and can cause workers to trip and fall. The level of the frequency of this hazard is 2 with a severity level of 4 or major, so it is included in the medium-risk category with a variable risk evaluation. These violations can be caused by the conditions of work environment for example lack of space in the workplace and low monitoring or supervision in the workplace (Baldissone *et al*., 2019).

Administrative control carried out is an inspection of equipment and goods by the foreman, if there are items scattered then it will be warned to be cleaned. The PPE control is carried out using shoes. The control assessment obtained was 50%; control requires more specific actions such as documentation. The residual risk after controlling is included in the low-risk category and is acceptable to workers.

Slipped Foot

The hazard of slipping is in the work process of taking sacks from the storage area to the packaging area. The packaging area is a place to fill feed ingredients into the sacks so that the floor in this area has a lot of feed ingredients scattered around. The scattered feed ingredients cause the floor to become slippery and can cause workers to slip and fall. The hazard of slipping also occurs in the step where the sack is placed on the table, the slippery surface of the sack can cause workers to slip. Some of the risk factors that cause slipping hazards, according to Wang *et al*. (2015) include poor housekeeping, poor layout, and slippery floors. Risks if this danger occurs are leg injuries, sprain, bruises, fractures, to muscle injuries. The frequency level of this hazard is 2 or often occurs with a severity level of 4 or major so that this hazard is included in the moderate risk category with a transparent risk evaluation.

The control rating is 50%, so more specific control is still needed. The residual risk is categorized as low or acceptable to the worker. Administrative control that is carried out is an inspection of the equipment and packaging area by the foreman. If it is not clean, the cleaning service will clean the dirt so that it does not interfere with the work process. PPE control is carried out by all workers wearing shoes. Shoes are used to avoid work accidents such as slipping or injuries to the feet in slippery workplace (Wong, Man and Chan, 2020). Technical control that can be done includes providing adequate lighting for workers and carrying out routine maintenance, for example, cleaning floors and workplace (Niu *et al*., 2019) .

Stitched Fingers

The hazard of stitched fingers occurs in the working process of sewing sacks that have been filled with feed using a sewing machine. The hazard is caused by the condition of the machine which often has trouble so that the workers' fingers are punctured by machine needles. This hazard can also occur because workers do not focus on their work. The risks of this hazard include cuts, torn fingers, chafed fingers, and cracks in the finger bones. Hazards associated with worker exposure to machinery can result from improper equipment maintenance and improper usage of equipment (Tipayamongkholgul *et al*., 2016). Before starting work, basic work safety procedures such as maintenance, inspection, and repair should always be carried out so that there are no accidents to workers (Wong *et al*., 2018). The level of the frequency of this hazard is 2 or unlikely with a severity level of 4 or major, so the risk assessment obtained is included in the medium-risk category with an evaluation of tolerable risk.

Administrative control is carried out by routine inspection of the engine by the maintenance division and is carried out intensely when the engine is experiencing trouble. If the machine has a problem, the worker should report it to the foreman and forward it to the maintenance division. Control is also carried out by foremen inspecting the work process and receiving information from workers if the machine breaks, and also reminding workers to be careful (Suma'mur, 2017). The control rating for this hazard related to machine problems is 65% because it has been well-implemented, but more specific interventions are needed. Meanwhile, the stitched hazard control assessment due to workers being careless is 50% because it still requires more specific action. The residual risk that is obtained is low, the controls implemented are effective and can be tolerated by workers. Administrative control that can be done to reduce the hazard of a stitched finger is to promote and practice safe work procedures (Jia *et al*., 2014).

Pinned Finger

The hazard of pinned fingers is in the working process of sewing sacks that have been filled with feed using a sewing machine, caused by machine

problems and workers who are careless so that the workers' fingers can be pinned. The risks from this hazard are bruising, sprains, and fractures of the finger bones. The level of frequency of this hazard is 2 with a severity level of 4 or major so that this hazard is included in the moderate risk category with a transparent risk evaluation. Administrative control related to machine problems is carried out with routine inspections by maintenance. Inspections by foremen are carried out to reprimand careless workers.

Based on the interview, workers already understand the SOP when a machine failure occurs, namely by reporting to the foreman to stop or take a break. The control value related to engine problems is 65% because it still requires more specific control. PPE control is still not needed because the use of gloves can pose a greater risk than before. The residual risk is categorized as low or acceptable to the worker. According to research conducted by Nkomo, Niranjan and Reddy (2018), work accidents that occur in forestry workers can be reduced by implementing training. Training is carried out by new workers who are about to start working and workers who will change tasks or get new assignments. In the factory studied, there was a significant decrease after occupational health and safety training was carried out.

Risk control that can be carried out currently is administrative control and PPE control. The company does not allow carrying out risk control by elimination, substitution, and technical engineering because the cost required is enormous, and the company location makes it impossible to do it. However, the risk control carried out at animal feed industry Sidoarjo indicates a decrease in residual risk.

CONCLUSION

Based on the hazard identification carried out, out of the five existing work processes in the packaging unit of animal feed industry Sidoarjo, there were 15 hazards with a risk analysis of 53% included in the medium risk category and 47% included in the high-risk category. The risk evaluation obtained was 53% including tolerable risk and 47% including intolerable risk. Risk control has been carried out in the packaging unit of animal feed industry Sidoarjo is administrative control such as equipment inspection and work process inspection by the foreman, and PPE control is carried out by providing shoes and hairnets. The residual risk that is obtained after controlling is 100% of moderate-risk reduction and 71% of high-risk reduction, so the residual risk is 33% moderate risk and 13% high risk.

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