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Identification of Work Accident Hazards Using The JSA Method In the Weaving Section At Pt X

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ABSTRACT

Work accidents are incidents related to work and the company. Work accidents occur due to uncontrolled events caused by several factors. According to data from the International Labor Organization (ILO), almost every day people die due to work accidents and work-related diseases at a rate of 2,78 million every year. The preliminary study that has been carried out shows that work accidents occurred in the weaving production section of PT X. The research aims to identify hazards using the Job Safety Analysis (JSA) method. This research uses descriptive research using observational descriptive methods. The sampling technique in this research was purposive, with as many as 4 respondents. This research instrument uses an interview guide and Job Safety Analysis (JSA) table which is analyzed using univariate analysis. The results of this research show that several stages of work in the weaving section have dangers such as being pinched, hammered, cut, hit by a beam, falling or slipping, and electrical short circuits which cause minor injuries, cuts leg fractures, bruises, aches, headaches and fires, machine.

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INTRODUCTION

Work accidents are caused by various factors, including hot working conditions, lots of flying thread dust, excessive distractions, machine images with safety symbols missing, and workers' ignorance of K3 regulations, especially those relating to the use of personal protective equipment. According to data from the International Labor Organization (ILO), almost every day people die due to work accidents or work-related diseases. With a case rate of 2.78 million people dying every year, including cases of 2.4 million workers (86.3%) who died due to work-related causes and 380,000 workers (13.7%) who died due to work-related diseases, it is estimated that overall or globally lost working days are equivalent to 4% of global Gross Domestic Product (GDP) and even in some places as much as 6% (ILO, 2019) (Putri, D.N., & Lestari, 2023). Based on the data obtained, there will be 22 cases of accidents in the weaving sector in 2021. This shows a high annual increase in work accidents in three weaving departments. Workers can experience minor to serious work accidents. Minor accidents can include a roll of cloth

spinning, being run over by a cartwheel, a finger being hit by a cutting tool, or being hit by a machine comb. Work accidents can cause fainting, bruising, pain, swelling, and cuts (Noverita, 2022).

Accidents are events related to work and company relations. The relationship in question is an accident that may occur while work activities are taking place in a company. Work accidents occur due to uncontrolled or unplanned events caused by several factors, namely humans, situations, or the environment, that disrupt the work process resulting in injury, illness, death, or damage to work property (Jaya Maulana, J. M., Ristiawati, R., Dewi Nugraheni Restu Mastuti, and Bondan Tetuka Wijatnaka, 2023). The implementation of K3 in Indonesia is still minimal due to a lack of awareness among workers or company parties, a lack of implementation of heavy sanctions, a lack of knowledge from human resources about operating equipment in the company, and so on. As Law No. 13 of 2013 explained concerning Employment, Article 86, Paragraph 1, every person who works has the right to obtain occupational safety and health without exception (Nartha and Multazam, 2023). Job Safety Analysis (JSA) is safety management that focuses on identifying and controlling hazards related to the series of jobs or tasks to be carried out. JSA focuses on the relationship between workers, work, equipment, and the work environment (Silvia, S., Balili, C., & Yuamita, 2023). PT X is a company operating in the woven sarong industry. The production section at PT X consists of several stages: preparation stage one, preparation stage two, dyeing, yarn spinning, weaving, finishing, quality control, and sewing.

The results of a preliminary survey that was carried out by conducting interviews with HRD showed that the jobs with the highest risk of experiencing work accidents were in the weaving production section. This is because this section uses machines and also requires high concentration in the work. Based on the above background, researchers are interested in the identification of work accident hazards in the weaving section of PT X using the Job Safety Analysis (JSA) Method. This research was conducted to better understand the dangers that occur in the weaving process and the controls that can be implemented to minimize the occurrence of work accidents.

METHOD

This research is case study research. This research uses descriptive observational research methods. This research was carried out at PT. The sampling technique in this research was purposive sampling, with as many as 4 respondents. Respondents involved in this study included the main informants, namely the K3 experts, supporting informants, including supervisors and the head of the weaving section, and triangulation informants who were factory workers. Respondents are considered sufficient to represent the explanation of work procedures in the weaving section.

In this research, the data collection method uses the results of completing the Job Safety Analysis (JSA) table and in-depth interviews with employees or workers in the weaving production section of PT. The data collection process was carried out during working hours according to the agreed time. The researcher previously carried out an internship to better understand the research environment and continued with data collection in the weaving section. The JSA method is a method for identifying work hazards by considering the work stages. The analysis carried out includes work stages, hazards, potential risks, impacts, and controls.

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The informants in this research include the main informant, namely the Occupational Safety and Health (OSH) within PT. The supporting informant is the head of the section, and the triangulation informant is the employee in the weaving production section.

RESULT

In carrying out the research, researchers interviewed informants using purposive sampling techniques. Researchers took information from 4 informants, consisting of 1 main informant, 1 supporting informant, and 2 triangulating informants.

Table 1. Characteristics of Informants

NO	Informants Research	Age	Work
1.	Informants 1	51 years old	Head of Weaving Division
2.	Informants 2	46 years old	Supervisor
3.	Informants 3	35 years old	K3 Expert
4.	Informants 4	29 years old	Worker

Based on Table 1, it is known that there are 4 informants, namely informant 1 as a supporting informant and the head of the section, who is 51 years old. Informant 2 and Informant 4 as triangulated informants as caregivers, supervisors, and workers are 46 and 29 years old, respectively, and Informant 3 as the main informant as a K3 expert is 35 years old.

Table 1.Identification of Hazard with Job Safety Analysis (JSA) Methode

No	Worker Steps	Hazard	Potential Risks	Impact	Control
1	Beam Placement	Physical Sources of danger from the yarn feed roll, such as the beam, beam trolley, and transferring the beam to the weaving machine. Ergonomics Bent body posture, pulling body posture. Gravity Uneven floor surfaces, and barriers on the weaving machine.	Crushed by cartwheels or trolleys, hit by beam, pinched by beam, tripped by weaving machine materials, and slipped due to uneven floor surfaces. Pain or discomfort in the worker's back and shoulders.	Bruised legs, broken bones in the leg, and cuts. Soreness in the back and shoulders, bruises, and swelling in the painful areas.	**Administrative:** Create clear and safe SOPs for beam placement. Conduct safety talks to improve work positions. Perform regular maintenance on the machine. **Elimination:** None (already in accordance with SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Substitution:** None (already in accordance with SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool

No	Worker Steps	Hazard	Potential Risks	Impact	Control
					cannot be removed or eliminated. **PPE (Personal Protective Equipment):** Use safety shoes.
2	Installation of the rail gun	Physical The source of danger from those loom rails that are shaped like sharp iron. Ergonomics Working postures that involve bending repeatedly	Caught in the loom rail, cut by it, or pierced by the loom rail. Pain or discomfort in the shoulders and back of the worker.	Minor injuries, cuts, stiffness in the back and shoulders, bruising, and swelling in the affected area.	**Administrative:** Develop clear and safe SOPs for installing rail guns. Perform regular machine checks to prevent malfunctions. Conduct safety talks to improve work posture. **Elimination:** None (already compliant with SOP) because the rapier loom machine meets the standards for weaving fabric. Thus, the equipment cannot be eliminated. **Substitution:** Use electric tools to tighten the wire on the rail gun. **PPE (Personal Protective Equipment):** Use special gloves to prevent injuries to the fingers.
3	Installation of the pick gear	Physical: The source of danger is the position of the power button located above the pick gear installation. Ergonomics: Repeatedly bending and squatting work posture.	The pestle tool is twisted, the top button of the tower is struck, and the pick teeth are pinched. Pain or ache in the worker's shoulder and knee.	Scratches on the hands, minor cuts, and bruises, soreness in the shoulder and knee, bruising or swelling in the painful area, and causing stiffness in the joints and muscles.	**Administrative:** Create clear and safe SOPs (Standard Operating Procedures) for installing pick teeth. Conduct safety talks to improve work posture. **Elimination:** None (already in accordance with SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Substitution:** None (already in accordance with SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated.

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No	Worker Steps	Hazard	Potential Risks	Impact	Control
					Engineering Controls: Install a guard on the top button of the tower to prevent it from being struck by the hand.
4	Tucking	Physical The source of the hazard comes from the gripper weaving machine. It also comes from the machine sector cover. Ergonomic Repeatedly bending work posture.	Pricked while changing the gun rail, pinched by the reed or gripper, and struck by the sector. Pain in the back and shoulder.	Cut, minor cuts, minor injuries, and complaints of soreness in the back and shoulder, bruising, swelling, and can cause headaches..	**Administrative:** Create clear and safe SOPs for tensioning. Conduct regular machine inspections. **Elimination:** None (already under SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Substitution:** None (already under SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Engineering Control:** Install guards and protectors on the sector to prevent workers' hands from being struck.
5	Tuck-in adjustment	Physical The hazard originates from the cutter tuck-in. Ergonomic Repeatedly bending work posture.	Pinched by the tuck-in tool, pricked by the cutter tuck-in, pain in the back and shoulder.	Minor injuries, cuts, stiffness, bruising, and swelling in the shoulder or back, which can also cause headaches.	**Administrative:** Create clear and safe SOPs for adjusting the tuck-in mechanism. **Elimination:** None (already under SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Substitution:** None (already under SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated.

No	Worker Steps	Hazard	Potential Risks	Impact	Control
					Engineering Controls: Install guards around the tuck-in mechanism. **PPE (Personal Protective Equipment):** Use specialized gloves.
6	Machine control and operation	Physical Hazards originate from the rapier weaving machine, uneven floor surfaces, and machine guards. Ergonomic Repeatedly bending work posture. Electrical Loose electrical outlets, exposed cables, and damaged cables.	Pinched by the weaving reed, pricked by the gun rail, tripped over weaving machine materials, electrical short circuit from exposed cables, pain in the back and shoulder.	Cut wounds, 9 broken nails, fractured finger bones, falls or slips, and machine fires. Stiffness, bruising on the back and shoulder, leading to headaches.	**Administrative:** Create clear and safe SOPs for machine control and operation. Conduct regular inspections. **Elimination:** None (already under SOP) because the rapier weaving machine is already standard for making woven fabric. Therefore, the tool cannot be removed or eliminated. **Substitution:** Replace cables with safer and more secure ones to prevent them from being exposed. Replace outlets with safer options. **Engineering Controls:** Repair problematic outlets, inspect loose and exposed cables.

Table 2 contains descriptions of work stages in the weaving department along with hazards, potential risks, impacts, and controls for each work stage. The work stages include beam placement, gun rail installation, pick teeth installation, tuck-in adjustment, and machine control and operation.

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Table 2 Risk Level

Number	Work Steps	Risk Level		
		P	S	PxS
1	Beam placement	1	4	4
2	Gun rail installation	3	2	6
3	Pick teeth installation	3	4	6
4	Tucking	2	2	4
5	Tuck-in adjustment	3	2	6
6	Machine control and operation	3	3	9

Note: P = Probability, and S = Saferity

Based on the hazard identification results using Job Safety Analysis (JSA) in the weaving process, several potential safety and health hazards were identified, including non-ergonomic work postures, getting caught in the weaving machine, cuts from the weaving reed, being struck by the sector, tripping hazards, being run over by the beam trolley wheels, being hit by beam rolls, and electrical short circuits leading to fires. Below are the analysis results using Risk Management AS/NZS 430;2004 for the weaving work process at PT X:

a. Beam Placement

Based on the information from Informant 3 and Informant 2 regarding the weaving process:

Informant 3: "…physical hazards include getting caught, pricked by the gun rail, and possibly being hit by a beam. These risks arise from lack of focus and care during work. Workplace accidents are unplanned events occurring during working hours that result in losses. According to the International Labor Organization (ILO), workplace accidents include falls, crush injuries, and being struck by objects (Putri, R., Sidik, T. H., & Pratiwi 2023)

Informant 2: There is a gravitational hazard due to non-ergonomic postures such as bending or pulling, leading to back and shoulder pain, stiffness, and potential Musculoskeletal Disorders (MSDs). Untreated MSD complaints can decrease work productivity and lead to workplace accidents (Sultan, M., Isnaniah Saputri, A., & Ramdan 2022). Gravitational hazards occur during the beam placement stage, involving tripping over weaving machine materials and slipping due to floor surfaces, resulting in minor injuries like bruises. The beam placement stage has a probability risk value of 1 (Very Low), meaning accidents are very rare, occurring approximately once every 5 years. The severity risk value is 4 (High), indicating injuries could include bruises, fractures (if run over by beam rolls), and cuts. These insights highlight the importance of maintaining focus, implementing ergonomic practices, and addressing potential hazards to mitigate workplace accidents in the weaving process.

b. Gun Rail Installation

Informant 3: "...could get caught, pricked by the gun rail, and could also be hit by a beam..."

Physical hazards include being caught, cut, and pricked by the gun rail, resulting in minor cuts and scratches (Sofa Alek Sulaeman, Aviasti 2024). These incidents occur due to lack of focus and attention during work.

Informant 3: "...there are also ergonomic hazards..."

Ergonomic hazards during gun rail installation include non-ergonomic postures such as repetitive bending, leading to stiffness in the back and shoulders. This occurs because workers often bend over for extended periods during the installation process. Risk assessment for gun rail installation: The probability (likelihood) value obtained during the study is 3, indicating a medium likelihood, meaning workplace accidents during gun rail installation are possible, occurring approximately once every 1 to 2 years. Severity value obtained is 2, indicating a low severity of workplace accidents during gun rail installation, resulting in minor cuts, scratches, and stiffness in the back and shoulders of workers.

c. Pick Teeth Installation

Physical hazards include being struck by the hammer tool, hitting the top tower button, and getting caught by the pick teeth, resulting in cuts on the hands, minor wounds, and bruising. These incidents occur due to a lack of focus, caution, and precision during work.

Informant 3: "...there are also ergonomic hazards..."

Ergonomic hazards occur due to repetitive and continuous awkward body postures, which can lead to musculoskeletal injuries (Hilda Fauziyah, Budhi Setianto, Muh Agus Ainur Rosyid 2023). Risk assessment for pick teeth installation: The probability (likelihood) value obtained during the study is 3, indicating a medium likelihood, meaning workplace accidents during pick teeth installation are possible, occurring approximately once every 1 to 2 years. Severity value obtained is 2, indicating a low severity of workplace accidents during pick teeth installation, resulting in cuts on the hands, minor wounds, bruising, and stiffness in the back and shoulders of workers.

d. Tucking-in

Informant 4: "...the hazards that occur are physical hazards and often electrical hazards..."

Physical hazards during the tucking-in process include being pricked while changing the gun rail, caught by the comb or gripper, and hitting the sector. Workplace accidents occur due to factors such as lack of focus and carelessness in performing tasks. The most common workplace accidents are caused by worker negligence, such as getting caught in the machine or being struck by weaving machine parts (Sagala, J., Bhakti, P., & Purwakarta 2021)

Informant 3: "...there are also ergonomic hazards..."

Ergonomic hazards during the tucking-in process include repetitive bending postures, which can potentially lead to symptoms of Low Back Pain (Jaya Maulana, J. M., Ristiawati, R., Dewi Nugraheni Restu Mastuti and Bondan Tetuka wijatnaka 2023). Risk assessment for tucking-in process: probability (likelihood) value obtained during the study is 2, indicating a low likelihood, meaning workplace accidents during the tucking-in process are unlikely, occurring approximately once every 2 to 5 years. Severity value obtained is 2, indicating a low severity of workplace accidents during the tucking-in process, resulting in cuts, minor wounds, and complaints of stiffness in the back and shoulders of workers.

e. Tuck in adjustment

Informant 1: "...the physical danger that occurs..."

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The physical dangers that occur during the tuck in adjustment phase include getting caught in the tuck-in device, and being pierced by the tuck in cutter, which can cause cuts, bruises, and pain. (Noverita 2022)

Informant 3: "...there is also an ergonomic danger..."

The ergonomic dangers that occur during the tuck-in adjustment phase are non-ergonomic working postures that occur due to workers bending and stooping during tuck-in adjustment and repair, or problems with tuck-in. This can lead to muscle disorders, and prolonged work system can lead to local or whole-body health problems(Yunilasari 2021)

In the process stage of tuck in adjustment, the risk assessment yielded probability (likelihood) and severity ratings. The probability rating obtained during the research period was 3, indicating a medium likelihood. This means that workplace accidents occurring during the tuck-in adjustment stage are possible, with incidents occurring approximately once every 1 to 2 years. The severity rating obtained during the tuck-in adjustment stage was 2, indicating low severity. The types of severity that occur during tuck in adjustment include minor injuries, cuts, and complaints of stiffness in the back, neck, and shoulders of workers.

f. Machine Control

Informant 4: "...the dangers that occur are mostly physical, and also electrical dangers..."

Informant 2: "...the dangers in weaving are mostly physical, but there are also electrical dangers. There was a short circuit a few years ago that caused a fire in the weaving machine, but thankfully it didn't spread and could still be controlled."

The physical dangers that occur include getting caught in the weaving comb and being pierced by the loom rail, as well as electrical dangers. These occur due to factors such as workers being less focused and careful in their work. Electric shocks or electrocution are among the 100 electrical dangers that occur unintentionally when people touch exposed electrical currents. Insufficient electrical installation can lead to shocks that can flow from anywhere (Ridwan, R., Sangi, N., Kilis, B. M. H., Ticoh, J. D., & Maharani 2023)

Informant 2: "...and there's also the danger of gravity..." The ergonomic dangers that occur include non-ergonomic working postures caused by workers' positions during machine control and maintenance. These postures involve bending, stooping, and squatting, which can lead to muscle stiffness or pain if done repeatedly and continuously.

In the process stages of machine control and operation, a risk assessment yielded probability (likelihood) and severity ratings. The probability rating during the research period was 3, indicating a medium likelihood. This means workplace accidents occurring during machine control and operation stages are possible, with incidents occurring approximately once every 1 to 2 years. The severity rating obtained during the machine control and operation stages was 3, indicating medium severity. The types of severity resulting from workplace accidents during these stages include cuts, broken nails, finger fractures, falls or slips, and machine fires.

CONCLUSION

Workplace accidents that occur in the weaving production department include physical hazards, ergonomic hazards, gravitational hazards, and electrical hazards. Risks of workplace accidents in the weaving production department include being crushed by wheels or trolleys, struck by beams, caught by beams, stumbling, slipping, being trapped, cut, pierced by loom rails, non-ergonomic working postures, hammered, bumped into top button towers, struck by sectors, pierced by tuck in cutters, and electrical short circuits.The weaving production department controls are implemented through administrative controls, substitution, personal protective equipment (PPE), and engineering controls.

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