

## Safety Education through Risk Analysis in the Printing Informal Sector

Rega Ahlunijar<sup>1\*</sup>, Ayu Fadilah Wahid<sup>1</sup>, M. Aulia Farhan Akmal<sup>1</sup>, Caroline Kirana Christi Rengganis<sup>1</sup>, Suci Karuniawati<sup>1</sup>, Howen Kholim<sup>2</sup>

<sup>1</sup>Department Public Health Science, Faculty of Medicine, Universitas Negeri Semarang, Indonesia

<sup>2</sup>University of Technology Sydney, Australia

\*Correspondence to: [reganijar@students.unnes.ac.id](mailto:reganijar@students.unnes.ac.id)

**Abstract:** The printing industry is one of the most informal industries in university environments, such as in Universitas Negeri Semarang which has many printers, ranging from printing books to banners. The printing industry is not free from risks of danger, even though it is only in a small sector, but all workplaces have their own risks of danger. The method used in this research was descriptive research. Analysis was carried out by collecting data through field observations and analysis using JSA. The population and sample in this study were 10 workers in three printing houses in the Universitas Negeri Semarang area. There are a total of 6 routine work processes carried out by workers in the printing industry with 38 hazards identified. The highest intensity risks were found in muscle, bone and skeletal disorders as well as skin irritation and respiratory problems. This was because when working the position of the worker was not ergonomic and the work involved chemicals in the form of ink. The recommended improvement for printing owners is the use of APB to minimize risks arising from identified hazards such as wearing masks to reduce exposure to chemical vapours.

**Keywords:** risk; hazard; printing; safety

## INTRODUCTION

Work accident is an incident that originates from a trip or during the work process that causes fatal or non-fatal injuries. The number of work accidents according to BPJS Employment data, from January to September 2021 were 82 thousand cases of work accidents and as many as 176 cases of work-related illnesses of which 65 percent were caused by Covid-19.

Risk is something that is often attached to every activity in a job. In the OHS field, risks that have the potential to cause large losses are things that must be controlled because they can threaten the safety of employees. Risks can be avoided by making potential countermeasures so that their impact can be reduced. A level of risk that is known before it occurs is very important in controlling this risk (Setiyoso, et al, 2019). Risk is an unpleasant (harmful) impact that comes from the activities or work processes (Triswandana, Armaeni, 2020). Risk is a combination of the probability or frequency of occurrence of an accident and the degree of severity of the accident including the resulting injury or health problems.

In tackling OHS risks, risk management is carried out to prevent accidents and minimize risks that occur due to work accidents. Risk management is an activity that manages risk that aims to prevent unwanted work accidents in detail, complete, planned and structured in a good system (Mardhotillah, 2020).

The printing industry is one of the most informal industries in university environments, such as Universitas Negeri Semarang, which has many printers ranging from printing books to banners. The printing industry is not free from risks of danger, even though it is only in a small sector, but all workplaces have their own risks of hazard.

## METHODS

The method used was descriptive research. Analysis was carried out by collecting data through field observations and analysis using JSA. The population and sample in this study were 10 workers in three printing houses in the Semarang State University area.

## RESULT AND DISCUSSION

**Table 1.** Hazard analysis results

Work process	Tools and materials	Hazard Type	Hazard Description	Risk
Create designs	1. Computer 2. Paper 3. Fountain pen	Physique	1. Got electric shock 2. Paper cut 3. Exposure to computer radiation	1. Newspaper sores in certain areas 2. Damage to the skin, muscles and blood vessels 3. Have an injury/disability 4. Tired, red, dry, irritated and blurred eyes
		Chemistry	1. Road dust 2. Exposed pen ink 3. Swallowed pen ink	1. Eye irritation 2. Respiratory disorders 3. Gastrointestinal disorders
		Biology	Germ or bacteria from dirty hands	Digestive problems
		Ergonomics	1. The sitting position is not ergonomic 2. Do not change positions for a long time	Musculoskeletal problems
		Psychosocial	Visitors	1. Fatigue and work stress 2. Inconvenience
Material preparation	1. Paper 2. Ink 3. Banner paper (flexi)	Physique	1. Crushed material 2. Stumbled over a pile of ingredients	Injured
		Chemistry	1. Ink spill 2. Ink swallowed	1. Skin irritation 2. Digestive problems
		Biology	Stung/touched by insects	Skin irritation
		Ergonomics	1. Pick up the banner material 2. Lifting excess weight	Muscle, bone and skeletal problems
Printing	1. Printers 2. Paper 3. Ink 4. Banners paper	Physique	1. Crushed material 2. Stumbled over a pile of ingredients 3. Got electric shock	1. Newspaper sores in certain areas 2. Damage to the skin, muscles and blood vessels 3. Have an injury/disability 4. Tired, red, dry, irritated and blurred eyes
		Chemistry	1. Ink spill 2. Ink swallowed	1. Skin irritation 2. Digestive problems
		Ergonomics	1. The work position has not changed for a long time	1. Fatigue 2. Muscle, bone and skeletal problems
Cutting	1. Paper cutter	Physique	1. Sliced / cut finger	Injury / disability

	2. Cutters 3. Scissors 4. Ruler 5. Paper 6. Banners paper	Chemistry  Ergonomics	2. Pinched finger 1. Inhaling chemical vapors from ink 2. Wet ink Posture is not ergonomic	1. Respiratory problems 2. Skin irritation  Disorders of muscles, bones and skeleton
finishing	1. Paper 2. Hammer 3. Glue	Physique  Chemistry  Ergonomics	1. Got hit by a hammer 2. Paper cut 1. Got glue 2. Glue inhalation 3. Live ink vapor 1. Head down posture 2. Perform repetitive movements for a long time	Causes cuts and injuries  1. Skin irritation 2. Respiratory problems  1. Fatigue 2. Disorders of muscles, bones and skeleton
Quality control	Books or banners that are ready	Physique Chemistry  Ergonomics	Paper cut Ink vapor inhalation  Posture when moving objects	Caused injury Respiratory problems  Muscle, bone and skeletal problems

Risk analysis for each work process in the printing industry is as follows:

#### **Hazard and risk analysis in the design process**

The risk analysis of the JSA method in the design work process is:

1. Electric shock. This can happen because the power cable that connects the computer across is not regular. If a worker is electrocuted, it will cause burns to certain areas and damage to the skin, muscles and blood vessels. The recommendation for handling this risk is to improve the layout of the tool.
2. Exposure to computer radiation. This happens because workers are in front of the computer for a long time. If workers are exposed to computer radiation for too long it will cause tired eyes, red, dry, irritated, and blurred vision. The recommendation for handling this risk is time management. Workers must apply the 20-20-20 rule, namely after 20 minutes of staring at the computer continuously, workers must look at distant objects (about 20 feet) for 20 seconds.
3. Inhale road dust. This happens because the location of the workplace is on the side of the main road and without barriers. If workers inhale the dust, it will cause respiratory tract disorders, besides that dust entering the eyes will cause eye irritation. The recommendation from this risk is that workers must use masks when the weather is hot, because when the weather is hot dust will fly easily.
4. Biological hazard resulting from germs or bacteria from dirty hands. This happens because workers eat while using their hands while working. If done it will be at risk of causing digestive problems. The recommendation for managing this risk is to make regulations regarding workers who are not allowed to eat while working. Workers may eat during break times and must wash their hands after finishing work.
5. Ergonomic hazards resulting from sitting positions that are not ergonomic and carried out for a long time. This happens because workers focus on the work process. If workers do not change their body position, it will cause fatigue and muscle, bone and skeletal problems. The recommendation for this risk is that workers should stretch every 60 minutes for 5 minutes.

#### **Hazard and risk analysis in the material preparation process**

1. Physical hazards, namely being crushed by material or tripping over a pile of material. This can happen because workers are not careful, and the arrangement of goods is not neat. If this happens, it can result in worker injury. This risk control recommendation is a change in the layout of goods.
2. Chemical hazards, namely ink spills and ink ingestion. This can happen because workers are not careful and do not wash their hands thoroughly before eating. If this happens it will cause skin irritation and digestive problems. This risk control recommendation is the determination of work shifts to avoid fatigue.
3. Biological hazard of being stung or touching an insect. This can happen because many piles of items that are not cleaned become hiding places for insects such as spiders and cockroaches. If this happens it can cause skin irritation. This risk control recommendation is a change in the layout of goods.

4. Ergonomic hazards, namely lifting and carrying banner materials with excessive loads. This is because the banner material is very large and heavy and is usually lifted directly from the floor in a non-ergonomic position. If this happens, it will cause muscle, bone, and skeletal problems.

#### ***Analysis of hazards and risks in the printing process***

1. Physical hazards, namely falling over materials or tripping over piles of materials. This can happen because the products that have been printed are not arranged neatly. In addition, there is a risk of electric shock. This happens because of the arrangement of the cables that cross the floor. If this happens it will result in burns to certain areas, damage to the skin, muscles and blood vessels, and injury.
2. The chemical hazard is ink spillage and ink ingestion caused by workers not being careful. When this happens, it will cause skin irritation and digestive problems. This risk control recommendation is the implementation of work shifts so that workers do not get tired.
3. The danger of ergonomics is that the working position does not change for a long time. This happens because the worker stands still watching the machine finish printing. When this happens, it will result in fatigue and problems in the muscles, bones, and skeleton. This risk control recommendation is time management, namely workers must stretch for 5 minutes every 30 minutes.

#### ***Analysis of hazards and risks in the cutting process***

1. Physical hazards are cuts or cuts and pinched fingers. This can happen because workers are less focused and not careful. If this happens it will result in cuts and injuries. This risk control recommendation is the implementation of work shifts so that workers do not get tired.
2. The chemical hazard is inhaling chemical vapours from the ink and being exposed to wet ink. This can happen because banners that have just finished production will emit a very strong odor. If this happens it can cause breathing problems. This risk control recommendation is the use of masks.
3. Ergonomic hazards are postures that are not ergonomic. This can happen because when cutting banners or work, the worker's posture is bent. This results in muscle, bone, and skeletal disorders. The recommendation for controlling this risk is to place the cutting tool higher, such as on a table, so that the worker has a better position.

#### ***Hazard and risk analysis in the finishing process***

1. The physical hazard is being hit by a hammer and being cut by paper. This happens because workers are not focused and are not careful. Doing so could result in injuries and injuries. This risk control recommendation is the implementation of work shifts so that workers do not get tired.
2. Chemical hazards include exposure to glue, inhalation of glue vapours, and inhalation of ink vapours. This happens because when finishing workers do not use masks or gloves. If this occurs, it will cause skin irritation and respiratory problems. The recommendation for controlling this risk is the use of PPE in the form of a mask.
3. Ergonomic hazards, namely head down posture and repetitive movements for a long time. This is because the process of installing the ring on the banner is done on the floor. This results in fatigue and disorders of the muscles, bones and skeleton.

#### ***Hazard and risk analysis in the quality control process***

1. Physical hazard i.e. paper cut. This happens because in this process the paper will be stacked and folded. Workers who are not careful can scratch the sharp edges of the paper. If this occurs, it may result in injury. This risk control recommendation is the implementation of work shifts so that workers do not get tired.
2. Chemical hazard, namely inhalation of ink vapours. This can happen because the finished product still emits a pungent ink odor. If this occurs, it can cause breathing problems. The recommendation for controlling this risk is the use of PPE in the form of masks.
3. Ergonomic hazards, namely posture when moving objects that are not ergonomic. This happens because workers lift goods from the floor in a bent position. When this happens, it can cause problems in the muscles, bones, and skeleton. This risk control recommendation is the provision of counseling regarding ergonomic hazards to workers.

## **CONCLUSION**

There are a total of 6 routine work processes carried out by workers in the printing industry with 38 hazards identified. The highest intensity risks were found in muscle, bone and skeletal disorders as well as skin irritation and respiratory problems. This was because when working the position of the worker was not ergonomic and the work involved chemicals in the form of ink. The recommended improvement recommendation for printing owners is the

use of APD to minimize risks arising from identified hazards such as wearing masks to reduce exposure to chemical vapours.

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