

# TOLUENE EXPOSURE MANAGEMENT FOR PRINTING MACHINE OPERATORS IN OFFSET PRINTING COMPANIES

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## TOLUENE EXPOSURE MANAGEMENT FOR PRINTING MACHINE OPERATORS IN OFFSET PRINTING COMPANIES

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### ABSTRACT

Printing ink that were comonly use in offset printing company contains organic pigments. The organic pigments are made from aromatic hydrocarbons such as benzene its derivatives. In short term, exposure to organic solvents can cause dizziness, nausea, and sleepiness. This study purpose is to analyze the management toluene exposure in printing company towards the printing machine operators. The method of this study is qualitative description. To check the data validity test uses data triangulation techniques. The total research informants numbered nine people consisting of seven printing machine operators as key informants and two managers as ordinary informants. The results this research obtained show that seven printing machine operators still do not understand the risks of toluene exposure in their work place, the lack of supervision from the printing manager and the absence of regulations or sanctions regarding the use of self protection gear play parts to why the printing press operators still do not fully understand the benefit of wearing masks or other personal protective equipment while working. In conclusion, 7 out of 9 informants experienced symptoms of being exposed to toluene due to lack of knowledge of toluene exposure which cause lack of personal protective equipment uses. The lack of regulations regarding the use of protective gear also play part in this. To fix the lack of control of personal protective equipment regulation in offset printing company, managers are required to make regulation of personal protection in printing work place and provide the appropriate personal protective equipment.

**Keywords:** Offset print ink, personal protective equipment (PPE), toluene

## INTRODUCTION

Printing is an industry that uses technology to produce printed products. The copies of the printing industry results can be in the form of words or pictures printed on paper, cloth, and other media. Every day, billions of printed product are produced, including books, calendars, newspapers, posters, invitations, and other materials.<sup>1</sup> Printing uses large amounts of flammable organic solvents and uses combustible materials such as paper, cloth, plastic when working.

The work process in printing is generally divided into four steps, namely: pre-press, make-ready, press, and post-press. A pre-press operation is a process that transfers print design data to a printing machine.<sup>2</sup> This operation involves chemical and physical processes such as exposure to ultraviolet (UV) light, photoengraving or laser printing, development, and further processing. Make-ready is a print preparation process where the printing machine is adjusted with the printing process that will be done. The Press step is the printing process. Finally, post-press is a finishing process such as binding, pasting, and so on. Printing uses large amounts of flammable solvents and uses combustible materials such as paper, cloth, plastic when working. Pigments are dyes that are insoluble, have larger grains, are more resistant to light, heat, and chemicals. Pigments are commonly used in offset inks such as gaseous inorganic pigments and soot. Pigments derived from natural dyes are dyes that are naturally present in plant and animal tissues.<sup>3</sup>

Exposure to organic solvents can be through inhalation, oral, and contact. Long-term health effects that can be caused due to exposure to benzene and its derivatives are damage to internal organs such as the liver, kidneys and lungs, and so on. Organic solvents can also cause damage to the central nervous system with effects such as drowsiness, impaired body coordination, decreased focus of mind and vision. Organic solvents (thinners) consist of various types of organic substances such as aromatic hydrocarbons such as benzene and its derivatives, aliphatic hydrocarbons (for example n-hexane), chlorinated aliphatic hydrocarbons (for example chloroform, CCl<sub>4</sub>), alcohols, or glucose and ether.<sup>4</sup> Time-weighted Average Threshold Value (NAV) of chemicals in the air of the workplace, with a number of working hours of 8 hours per day or 40 hours per week, states that benzene is included in the group. A2 (category of carcinogenic chemicals for humans) has TLV of 10 ppm or 32 mg/m<sup>3</sup> of benzene in the air.<sup>5</sup>

Exposure to organic solvents within the scope of work in printing can cause dizziness, nausea, and irritation, and long-term exposure can lead to cirrhosis (decreased liver function), decreased kidney function, and nervous disorders.<sup>4</sup> In a study conducted by Fatmawati, as many as 58.5% of printing operators in the Rappocini District of Makassar City who did not use personal protective equipment (PPE) while working had dermatitis disorders.<sup>6</sup>

The purpose of this study was to analyze the self-protection management of printing machine operators against exposure to toluene in the Palembang city offset printing press. Other factors that can influence self-protective behavior by printing workers can be analyzed using Lawrence Green's theory, namely predisposing factors (knowledge, perceptions, motivation, attitudes), enabling factors (supporting facilities), and reinforcing factors (policy, supervision, regulations).<sup>7</sup>

## METHOD

This research use descriptive qualitative method with in-depth interviews as a method of data collection. The data validity test used data triangulation technique. This study used a qualitative research design. Information obtained is usually in the form of words or text. Data in the form of words or text is then analyzed. The results of the analysis can be in the form of a description or description or it can be in the form of themes. From these data, interpretation is made to capture the deepest meaning. After that, a personal reflection (self-reflection) is made and describes it with other scientific studies previously made. The final results of the qualitative research are written in the form of a written report. The report is somewhat flexible because there are no standard provisions on the structure and form of the qualitative research report.

Informants in this qualitative research are divided into two; key informants and supporting informants. The main criteria for key informants are people who are willing to share concepts and knowledge with researchers and can communicate with researchers. Researcher data collection starts with key informants to get a complete and comprehensive picture of the problem being observed.<sup>8</sup> The research was carried out in two offset printers in Palembang City, namely; X Printing Company and Y Printing Company. The key information in this study is divided into two; 7 printing machine operators as key informants and 2 managers as supporting informants. The informants are willing to share concepts and knowledge with researchers and can communicate with researchers through in-depth interviews, which supported by observation check-lists and documentations in form of photos, recording, and library study sources.

## RESULT

### 1. Source of Toluene Exposure

The main sources of toluene exposure at X Printing Company and Y Printing Company are derived from inks and solvents used as ink thinners. The source of benzene vapor in printing came from ink droplets in the open roll cylinder of the printing machine, printed products, ink spills, and a funnel for inserting ink into the funnel or jerry can.<sup>9</sup> The source of toluene or any other benzene derivatives exposure is identified by looking at the presence of toluene in the ink or solvent ingredients. The ink material ingredients can be seen from the ink patents.

X Printing Company using KONICA ink which produced by Konica Minolta, a company that focuses on the printing industry. On patent filed behalf of the company Konica Minolta, with patent code USOO7604.343B2. Konica Minolta company uses benzyl methacrylate, benzyl acrylate, fluorobenzyl group, and other methoxybenzyl group groups as solvent components of the ink. Benzyl is a group of compounds with the formula  $C_6H_5CH_2-$ , which is made from toluene ( $C_6H_5-CH_3$ ), which is a benzene derivative compound.<sup>10</sup> Meanwhile, Y Printing Company uses Syner-G EX inks produced by the Sun Chemical company, which is a company that focuses on producing inks and ink pigments. The patent filed by the Sun Chemical company entitled Energy Curable Lithographic Inks Containing Lactic Acid Resins which was released in 2014 states that the ink produced by Sun Chemical uses toluene, a derivative of the benzene group of compounds, as a solvent.

Exposure to toluene within 30 to 60 minutes and below 200 ppm can cause acute symptoms such as dizziness, nausea, drowsiness, tremors, and various respiratory symptoms such as nasal discharge and tightness. breath. Acute effects on the upper respiratory system caused by exposure to toluene generally appear 6 hours after exposure. In high doses such as 200 to 500 ppm, toluene can cause loss of balance, loss of appetite, and memory loss.<sup>11</sup>

**Table 1**  
**Symptoms of Acute Toluene Exposure to Printing Machine Operators at Work**

No.	Name	Symptoms				
		Headache	Nausea	Tremor	Sleepiness	Others
1.	Hr	-	-	-	-	-
2.	Rp	-	-	-	-	Shortness of breath
3.	Bm	-	-	-	-	Often feel thirsty while working
4.	Fd	√	-	-	-	Coughing
5.	Fth	√	√	-	-	-
6.	Fhr	√	-	-	-	Shortness of breath
7.	Ea	√	√	-	-	-
8.	Ftm	√	-	-	-	-
9.	Ahm	√	-	-	-	Shortness of breath

**Table 2**  
**Number of Informants Experiencing Acute Symptoms of Toluene Exposure**

No.	Type of informant	Amount	Number of Informants Experiencing Acute Symptoms of Toluene Exposure
1.	Key Informants	7	5
2.	Supporting Informants	2	2
	<b>Total</b>	9	7

The results of interviews at X Printing Company and Y Printing Company, show that as many as 5 out of 7 key informants who work in the printing press room feel symptoms of dizziness, nausea, and shortness of breath while working. Meanwhile, two managers who oversee the print work process do not work in the machine work process but also feel dizzy because the manager's workplace placed near the printing machine room. The total number of informants who felt acute symptoms of exposure to toluene was 7 out of a total of 9 informants. Apart from symptoms of low levels of toluene exposure such as dizziness, nausea, and tremors, 3 out of 9 informants also admitted to experiencing shortness of breath while working. The attitudes observed by the researchers were the regularity of printing machine operators in wearing PPE during 8 hours of work and the correct way to use PPE.

## 2. Knowledge

Based on in-depth interviews with 9 informants, of the 7 printing machine operators as key informants interviewed, one printing machine operator considered that wearing a mask or other PPE while working in the printing room was not important

because it could interfere with his work. Printing machine operators who thought that the use of masks or other PPE was not important came from Y Printing Company.

This is inversely proportional to the results of observations by researchers where all key informants from Y Printing Company wore masks while working for seven days even though the use of masks was only a few hours in the morning. Meanwhile, not all key informants from X Printing Company wore masks during the seven-day observation. This is also inversely proportional to where all the key informants from X Printing Company consider wearing masks to be important, but two out of four key informants never wore masks during the seven days of observation and claimed to have never worn masks from the start of work.

### 3. Attitudes of Workers in Wearing PPE at Work

The attitudes observed by the researchers were the regularity of printing machine operators in wearing PPE during 8 hours of work and the correct way to use PPE. Data obtained from observations for seven days at X Printing Company and Y Printing Company.

**Table 3**  
**Observations on the use of PPE for the printing machine operators from X Printing Company**

No.	Attitudes observed	Days						
		1	2	3	4	5	6	7
1.	Using mask while working	√	-	-	√	-	√	√
2.	Wearing industrial apron while working	-	-	-	-	-	-	-
3.	Wearing industrial gloves while working	-	-	-	-	-	-	-
4.	Wearing boots while working	-	-	-	-	-	-	-
5.	Using mask properly	√	-	-	√	-	√	√
6.	Wearing industrial apron properly	-	-	-	-	-	-	-
7.	Wearing industrial gloves properly	-	-	-	-	-	-	-
8.	Wearing boots properly	-	-	-	-	-	-	-

Of the four key informants from X Printing Company, two key informants were never seen wearing masks or other PPE while working. In addition, for seven days, there were three days where the printing machine operator did not wear a mask at all. Printing machine operators only wear masks when the smell of the printing press is strong due to heavy ink usage. The smell of ink is strongest when black colored ink is used to color the blocking part (the part with pure colors, not mixed with other colors) of the banner.

**Table 4**  
**Observations on the use of PPE for the printing machine operators from Y Printing Company**

Nu.	Attitudes observed	Days						
		1	2	3	4	5	6	7
1.	Using mask while working	√	√	√	√	√	√	√
2.	Wearing industrial apron while working	-	-	-	-	-	-	-
3.	Wearing industrial gloves while working	-	-	-	-	-	-	-
4.	Wearing boots while working	-	-	-	-	-	-	-
5.	Using mask properly	√	√	√	√	√	√	√
6.	Wearing industrial apron properly	-	-	-	-	-	-	-
7.	Wearing industrial gloves properly	-	-	-	-	-	-	-
8.	Wearing boots properly	-	-	-	-	-	-	-

Based on the results of observations made by researchers for seven days, the printing machine operator of X Printing Company did not wear a mask every day but the printing machine operator of Y Printing Company wore a mask every day in the seven days of observation. Apart from masks, X and Y Printing Company did not provide any other PPE. No printing machine operators wears a mask or other PPE for 8 hours of work. Almost all printing machine operators no longer wear masks after 11 o'clock because of the hot afternoon temperatures in work place.

#### **4. Availability of PPE at the Printing**

Based on observations for 7 days, X and Y Printing Company provided masks for employees, especially printing machine operators. X Printing Company provides one motorcycle mask for each worker and Y Printing Company provides surgical masks every day. Apart from masks, the printer never gives other PPE to printing machine operators such as gloves, aprons and shoes.

#### **5. Applicable Regulations in Printing Regarding the Use of PPE**

Based on in-depth interviews with 9 informants, X and Y Printing Company do not have permanent written regulations regarding the use of PPE in the print room. The two print managers have reminded operators to wear masks while working but no one operator wears masks regularly.

#### **6. Manager's Supervision of the Use of PPE in the Printing**

Based on the results of observations for 7 days and in-depth interviews, one way to ensure that printing machine operators wear masks while working is by monitoring the print manager. Even with managers present every day at the printing press, workers still don't wear masks regularly because of this. This is supported by the absence of permanent written regulations from the printing director regarding the use of masks or PPE while working in the print room. Thus, supervision still cannot be optimized in the printing press because there are no fixed regulations. Especially for Y Printing Company, supervision from superiors and managers is much lax because the print room has CCTV so that managers and superiors don't feel the need to directly supervise employees' work.

### **DISCUSSION**

#### **1. Exposure to Toluene in Printing**

According to Faisal, benzene and its derivatives are included in volatile organic compound pollutants, which means they are hydrocarbon bond chain compounds.<sup>12</sup> In printing, exposure to benzene is primary air pollution because printing has a direct source of that exposure, such as paint and oil. Benzene which is a carcinogenic compound has negative effects when inhaled directly. The impact of benzene exposure can be acute, such as dizziness, nausea, and tremors.<sup>13</sup> Whereas in the long term, exposure to benzene and its derivatives can cause aplastic anemia where benzene can damage the function of the spinal cord, liver, and kidneys.<sup>14</sup> As a volatile compound, the upper respiratory organs such as the nose, larynx, and throat are the first organs to be affected by long-term exposure to toluene. In the long term, exposure to toluene can result in decreased function of the upper respiratory tract consisting of the nose, throat, and larynx, and damage the nerves associated with the sense of smell. In addition to decreased olfactory and lung

function, long-term exposure to toluene can result in decreased nerve function causing drowsiness, tremors, nystagmus (involuntary eye movements), hearing loss, and vision problems. Apart from the lungs and nerves, long-term exposure to benzene and its derivatives is also speculated to cause liver and kidney disorders.<sup>15</sup>

The results of interviews with informants from X and Y Printing Company showed that almost all informants, both printing machine operators and managers, stated that they had experienced mild symptoms of exposure to benzene or toluene while working. Symptoms of low or acute exposure to toluene include dizziness, nausea, and tremors, as well as upper respiratory system disorders such as shortness of breath or nasal discharge.

The number of informants who experienced mild or acute symptoms caused by exposure to toluene was 7 out of a total of 9 informants. Some workers claim that they no longer feel dizzy after getting used to the smell of ink and solvents, but working hours and workplaces, and unchanging sources of exposure indicate that workers remain exposed to while working in a print shop. Two managers who oversee the print work process do not participate in the work, in the machine work process but also feel dizzy because the manager's workplace is near the machine room.

The symptoms of dizziness and nausea felt by employees of X and Y Printing Company are in line with the research of Febriantika which examined the impact of benzene exposure on printing employees in Makassar. The results of research by Febriantika show that at low levels, exposure to benzene can cause dizziness and drowsiness, fast heartbeats (tremors), headaches, and loss of balance.<sup>16</sup> This is also in accordance with the Benzene Guidelines which states that the acute effects of exposure to benzene and its derivatives are dizziness, headaches, drowsiness, tremors, and loss of consciousness. The effects of benzene exposure can increase when benzene is mixed with alcohol which can increase the level of toxicity also states that there are no standardized guidelines for dealing with benzene exposure through the air.<sup>13</sup> According to the Agency for Toxic Substances and Disease Registry<sup>11</sup>, the acute symptoms of exposure to toluene through breathing are headache, dizziness, and drowsiness. Exposure to toluene through the skin can cause irritation, it also applies to the eyes and can cause poisoning if swallowed. There is no standardized medical treatment to treat toluene poisoning. To overcome the acute effects of toluene exposure such as dizziness, nausea, and drowsiness, it can be overcome by staying away from the source of exposure and breathing clean air until the acute symptoms disappear.

## **2. Knowledge**

In Festinger's Dissonance Theory, an individual always tries to balance himself to behave in accordance with the knowledge he has. Dissonance (imbalance) occurs because of a conflict within an individual who tries to adjust himself to the knowledge he gets in the environment he is in. In other words, the mismatch of a person's actions with the environment he is in is caused by inadequate knowledge or environment so that a person has difficulty adapting.

The mismatch of a person's behavior in an environment or system can be corrected by providing knowledge that is appropriate to the environment and the individual's job is located. In other words, the knowledge provided to printing machine operators must be appropriate to field conditions where exposure to benzene causes workers to wear PPE.



The results of interviews with printing machine operators as key informants at X and Y Printing Company show that all printing machine operators understand their work as print machine operators but not all printing machine operators know and understand the risk of toluene exposure and the importance of wearing PPE to minimize exposure risks.

In accordance with the theory of Dissonance Festinger, all key informants understand their duties as printing machine operators because they can explain their duties as printing machine operators, but not all operators know the risks of exposure to benzene or know that wearing PPE while working is important. All printing machine operators also know basic PPE such as masks and their functions. However, two out of seven printing machine operators interviewed never wore masks or other PPE at work because they felt wearing masks at work was unnecessary and could interfere with work in the printing room. This is because two out of seven printing machine operators do not understand the dangers of exposure to toluene while working in a printer even though they understand the function of masks. This incident shows dissonance in Festinger's theory that the printer operator's lack of knowledge of exposure to toluene in the print room has resulted in printing machine operators not using personal protective equipment in an environment or situation that requires the use of personal protective equipment.

This is in line with Hidalgo's A research, which examines the dissonance that occurs in-market consumers towards organic food products, showing that market consumers do not buy organic food products even though they are able to buy organic food ingredients and already know the benefits of these organic food products. This phenomenon occurs due to a lack of consumer understanding of the positive impact of organic foodstuffs on the environment and health. Hidalgo concluded that knowledge is one of the main keys that can cross this dissonance. By providing education about the benefits of organic food ingredients, this dissonance can be overcome.<sup>17</sup> Likewise, the research of Jamitko which shows that the level of knowledge shows a significant relationship with the use of PPE in PT Wika Beton Boyoali construction workers.<sup>18</sup>

Meanwhile, the lack of knowledge of the print manager or director can also cause dissonance in which managers or employers do not make any regulations for wearing PPE and do not provide adequate knowledge to printing employees about the dangers of benzene exposure and the importance of wearing PPE. This is in accordance with PERMENAKERTRANS Regulation No. 08/MEN/VII/2010 Article 5, which states that entrepreneurs or managers are obliged to announce in writing and put up signs regarding the mandatory use of PPE in the workplace. Employers and managers are also required to equip employees who work in printing companies with knowledge of the dangers of chemical exposure and the importance of wearing PPE.<sup>19</sup>

### **3. Attitudes of Workers in Wearing PPE**

The attitude of workers in wearing PPE was measured through in-depth interviews and observations for a week. Based on the results of in-depth interviews with seven key informants, two of the seven key informants never wore masks at all and the other five wore masks at certain times, namely when they were sick and when the smell of ink was very strong. In addition, there are no printing machine operators who wear masks regularly because they feel uncomfortable and hot when wearing masks, operators also find it difficult to communicate while working while wearing masks, and some printing

machine operators say they do not know how to wear the correct surgical mask because not sure which side of the mask is outside inside when wearing it. This result is not in accordance with the research of Maesaroh & Nurtjahjanti which shows that there is a positive relationship between attitudes and the use of PPE, this positive relationship can result in more frequent use of PPE.<sup>20</sup> Likewise with Prasetyo's research which shows that there is a positive attitude towards the majority of PT. Pura Barutama Kudus with the use of PPE and resulting in compliance with the use of PPE.<sup>21</sup> From the discrepancies of the observation results with previous research, it can be concluded that there is no significant relationship between attitudes and the use of PPE in X and Y Printing Company.

Changing the attitude of employees of X and Y Printing Company can be through Behavior Change Strategies by WHO, behavior change can occur through; natural change, planned change, and willingness to change. Meanwhile, to change the attitude or behavior itself can be done in three ways; use force (enforcement), rule of law and law, and education.<sup>22</sup>

Enforcement can change behavior through bullying, but change may not last long because individuals who must change must realize the benefits of changing their own behavior. Using regulations and laws can be used by making written regulations regarding PPE at X and Y Printing Company which are used as references. The last way to change someone's behavior is through effective education with the discussion method. The existence of discussions between managers and printing workers or between workers about the risks of benzene exposure and the use of PPE can change the behavior of workers in wearing PPE while working. To realize this, workers and managers as well as employers must create a good working atmosphere and work relations so that discussions about the use of PPE at work can run well. At the same time, to support education as a method of changing attitudes, it is also important to establish legal regulations so that they can become the basis for strengthening attitude change with education.

#### **4. Regulations for the Use of PPE in the Workplace**

In Siregar's research, shows that the majority of respondents who are printing employees do not use PPE This is due to the discomfort of the PPE used, and the absence of a system or procedure in the printing industry that requires workers to use PPE while working.<sup>23</sup> This phenomenon is almost the same as the results of in-depth interviews with X printing machine operators and printing machine operators Y Printing Company, where operators claim to be uncomfortable when wearing masks while working and the absence of definite rules or regulations regarding the use of PPE in printing causing supervision and procedures wearing PPE is loose.

The director and manager of X and Y Printing Company do not have a fixed regulation regarding the use of PPE in printing. In accordance with the PERMENAKERTRANS Regulation No. 08/MEN/VII/2010 Article 5, entrepreneurs or managers of a company are required to announce in writing and put up signs regarding the mandatory use of PPE in the workplace.<sup>19</sup>

The application of PPE is the last risk control step that can be taken based on the risk management hierarchy by the Health and Safety Executive by the Health and Safety Executive. Before taking the step of providing PPE, X Printing Company has provided administrative management steps where the printing company provides sterile milk to minimize the impact of exposure to toluene. Although sterile milk has been shown to

minimize the effects of poisoning, there are no studies that can confirm that sterile milk can reduce the effects of benzene exposure and its derivatives. X Printing Company also does not comply with the Medical Guidelines for Toluene by the Agency for Toxic Substances and Disease Registry which states that there is no specific medical treatment to treat exposure to toluene or toluene poisoning.<sup>11</sup>

If X and Y Printing Company apply a regulation regarding the use of PPE in the workplace, then the entrepreneur or manager is obliged to announce in writing to all employees. Implementing regulations and also providing knowledge about the risks of chemical hazards, especially exposure to benzene in printing, can change the behavior of workers to comply with wearing PPE while working.

### 5. Availability of PPE

X and Y Printing Company have provided masks for printing machine operators and other employees. This is in accordance with PERMENAKERTRANS Regulation Number 08/MEN/VII/2010 article 2 which states: 'employers are obliged to provide PPE for workers/laborers in providing PPE such as gloves, aprons, and shoes, as well as other types of masks or respirators for workers. Provision of gloves, aprons, and shoes is important because printing workers, especially printing machine operators, are at risk of being exposed to ink and alcohol through the skin.<sup>19</sup> However, during the 7-day observation conducted by the researcher, it was shown that the frequency of using PPE was still very low at X and Y Printing Company even though PPE masks were provided. This shows that there is no significant relationship between the availability of PPE and compliance with the use of PPE. The results of this observation are consistent with Soendoro's research, in the results of Soendoro's research, compliance with the use of PPE in printing does not have a strong correlation with the availability of PPE.<sup>24</sup> This is due to several reasons such as the discomfort of PPE and the lack of PPE alternatives provided, which are also in line with the results of in-depth interviews at X and Y Printing Company where employees do not wear PPE due to the discomfort of PPE.

The types of masks provided for X Printing Company employees are cloth masks and the types of masks provided for Y Printing Company employees are surgical masks. The reason why X Printing Company provides motorcycle masks for its employees is that the availability of surgical masks in pharmacies can be limited at any time.

Rules for wearing masks according to WHO, disposable masks such as surgical masks are used only once before being thrown away. Meanwhile, the effectiveness of cloth masks has not been proven to protect the wearer from exposure to viruses, bacteria, or chemicals. Surgical masks, also known as surgical masks, do not have the perfect ability to cover the nose and mouth because they have gaps on all four sides of the mask when worn. Wearing a procedure mask is not the right step to reduce the risk of exposure to dust and chemical gases because procedure masks are not certified as good respirators by the National for Occupational Safety and Health (NIOSH) and the European Committee for Standardization (ECS).<sup>25</sup>

In order to reduce the risk impact of benzene exposure, employees of X and Y Printing Company need a tight-fitting respirator that can cover half the face. An example of a respirator that is easily available and used is the N95 respirator. In addition to masks, X and Y Printing Company need to provide protective equipment for feet, hands, and body in accordance with the regulations of the Minister of Manpower and Transmigration

of the Republic of Indonesia Regulation of the Minister of Manpower and Transmigration of the Republic of Indonesia Number Per.08/MEN/VII/2010 concerning Personal protective equipment. The recommended foot, hand and body protection can be in the form of footwear or shoes, gloves and aprons to prevent skin contact with solvents and inks while working. Foot protection, gloves, and aprons are needed because ink and solvent contact with the skin can cause irritation and allergies, even blistering if exposed to too long and frequently as research by Agbenorku, on the occupational risks of workers in a printing press in Ghana, India, shows that dermatitis and several other skin diseases are among the main diseases suffered by workers in printing due to contact with inks, solvents, and some other chemicals while working.<sup>26</sup>

## 6. Supervision from Managers or Entrepreneurs

Based on the results of observations during the week conducted by researchers, the supervision while working in a printing shop is still lacking because entrepreneurs do not have regulations and do not apply regulations regarding the use of PPE. This is also supported by the lack of supervision from managers. Employers are also rarely shown directly by employees in the print room. For X Printing Company, it is lax to supervise busy owners or managers, while for X Printing Company, it is lax to supervise because the printer has CCTV for employees to work with. Managers who are in the printing press more often remind printing machine operators to wear PPE, but the implementation of PPE usage is still not optimal because printing machine operators feel hot and uncomfortable when wearing masks. The absence of regulations resulting in no sanctions or sanctions for those who do not wear PPE while working. The results of this study are not in accordance with the research of Jatmiko et al which states that there is a significant relationship between supervision and the use of PPE on construction workers. The results of research by Lobis & Ariyanto also show that there is a significant influence between the supervision and use of PPE at PT Jamu Air Mancur Palu, this result is not consistent with the results of observations at X and Y Printing Company which even though the manager has destroyed the work process at printing, did not show an increase in the frequency of using PPE.<sup>27</sup>

Control or supervising is a function in functional management that must be carried out by every leader of all units/work units for the implementation of work or employees who carry out in accordance with their respective main duties. Thus, supervision by leaders, especially those who have built-in control, is a managerial activity carried out with the intention of avoiding irregularities in carrying out work. A deviation or error occurs or at during work performance depending on the ability and skill level of the employee. Employees who always receive direction or guidance from their superiors tend to make fewer mistakes or deviations than employees who do not receive guidance from their superiors.

## CONCLUSION

Based on the results of interviews with informants, as many as 7 informants experienced mild symptoms of exposure to toluene such as nausea and dizziness, which correspond to acute symptoms caused by exposure to benzene and its derivatives. The main source of exposure to toluene is inks which contain synthetic dyes derived from

aromatic hydrocarbons such as benzene and toluene which are benzene derivatives. The knowledge of printing machine operators and offset printing managers in the city of Palembang regarding the impact of toluene exposure and the use of PPE is still lacking, and with supervision and no permanent regulations on the use of PPE, the application of the use of PPE in offset printing within 8 working hours per day is still lacking. To improve this condition, Manager and Director of X and Y Printing Company must provides knowledge about the dangers of toluene exposure in printing and the function along the benefit of using PPE to printing employees, especially printing machine operators. In addition, the printing company must provides N95 respirators or other standard respirators as well as other PPE such as aprons, shoes and gloves for the employees' PPE in the printing shop.

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