



Analysis of Accident and Occupational Diseases with HAZOP Method and The Risk Control of Batik Papringan Workers, Banyumas

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Abstract

. An industry that has danger is Batik Papringan, Banyumas. Workers have not implemented Occupational Safety and Health (OSH) at work. It can be seen from the physical environment with poor lighting, workplaces that do not apply Ringkas, Rapi, Resik, Rawat, Rajin (5R), not using Personal Protective Equipment, unergonomic position, and feeling anxious due to decreased demand. Therefore, it is necessary to analyze occupational accidents and diseases and their control. The study took time in August 2020. The population was 200 people. The sample was obtained with the inclusion criteria, namely all Batik workers who were actively working until August 2020, while the exclusion criteria were workers who changed professions so that 190 people were obtained. The research design was cross-sectional with mixed-method analysis. The research was conducted using the HAZOP (Hazards and Operability Studies) sheet instrument. HAZOP sheet consists of job observation, hazard identification, Likelihood, and Consequences scoring, risk categorization, and control. The calculation results show that there is an extreme risk of three hazards (exposure to chemicals from wax, cloth dye, wood dust; bending attitude, static position; not applying 5R). The three extreme risks are respiratory disorders, dermatitis, fatigue, low back pain, Carpal Tunnel Syndrome (CTS), effectiveness, and efficiency of work decrease. The conclusion is that workers are at extreme risk. Employees need to be committed to risk management through disciplined risk control.

Introduction

Occupational Safety and Health (OSH) is vital for workers. Occupational Safety and Health concerns in protecting the safety, health, and welfare of workers at their workplace by preventing injury or diseases (Khan et al., 2014). Undang-Undang No 13 Tahun 2003 said 86 states that workers have the right to occupational safety and health protection, morality protection, and treatment according to human dignity (UU RI No 13 Tahun 2003, 2003). We can achieve occupational safety and health protection by preventing and reducing the risk of occupational accidents and diseases. The results is the creation of a safe and comfortable work environment that supports a company or organizational goals achievement through effective and efficient work activities (Mock et al., 2018). The use of equipment

(machines) and materials in the workplace raises the risk of accidents and occupational diseases because the equipment (machines) and materials have potential hazards (Petrović et al., 2020). According to Heinrich's theory, occupational accidents and diseases are caused by an unsafe act (unsafe behavior) and unsafe conditions (unsafe environment). Unsafe action is an action in working that is not following a predetermined Standard Operating Procedure (SOP). Occupational accidents and diseases caused by unsafe behavior occurred in approximately 88% of cases, 10% by unsafe environments, and 2% by provisions that created humans. Occupational accidents and diseases are caused by potential hazards and risks in the work environment, that is not minimized or controlled. Hazards are all aspects of technology and activities that pose a

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risk. Hazards is a source or situation that can cause injury or health problems, damage to equipment, materials and the environment, or a combination of these. Besides, the risk which is also another aspect of an accident is defined as the likelihood or severity or a combination of the two is causing an occupational accident or disease (Yuebing et al., 2011).

Hazards that can cause accidents and occupational diseases consist of various types, namely physical, chemical, biological, ergonomic, and psychosocial. Physical hazards consist of mechanical, electrical, heat, fire and explosion, radiation, noise and vibration. Chemical hazards consist of dust, metal, chemical, and toxic gases. Biological hazards consisting of bacteria, viruses, and animals. Ergonomic hazards such as position and movement at work. While psychosocial hazards such as relationships and conflicts between workers. The number of hazards and risks in the work environment may consist of more than one hazard and risk. Thus, workers should identify hazards and risks to prevent accidents and occupational diseases (Choi et al., 2020). Indonesia ranks first with the highest number of work accident cases in Southeast Asia. Based on data from the Kementerian Ketenagakerjaan RI in 2006, the number of work accident cases in 2003 was 105,846, in 2004 it was 95,418, in 2005 it was 96,081, and in 2006 it was 70,069. There are about 10.3 million workers in the private sector of Saudi Arabia alone, while the number of injuries and accidents in construction is much higher than any other industry in the country (Emad, 2019). Although there has been a decrease in cases, this figure still tends to be high. Therefore, it is necessary to implement better OSH in various sectors, both formal and informal sectors. One of the informal sectors that are developing and becoming local wisdom in Indonesia is Batik. Batik Banyumas is a batik that has a strong influence from Batik Solo and Yogyakarta. Banyumas batik is also a batik emphasizing more symbolism. It is different from Batik Pekalongan, which has more decorative forms (Sholikhah et al., 2017).

The word 'batik' was derived from the Javanese word meaning wax writing. It was the process of resist, which was known to be an ancient method of applying design to porous

surfaces. Parts of the fabrics are covered with melted wax, rice, paste, and some other non-water dissolve substance, and the fabric is later submerged in, or painted with, various colours of dyes (Poon, 2017). Based on the preliminary studies conducted by researchers, one of the Banyumas Batik centers is Papringan Village. The majority of Papringan Batik has plant and animal motifs. However, there are also other motives, such as river views. The making of the motif depends on the taste and inspiration of the batik maker. The total number of batik makers in Papringan Village is approximately 200 batik. Some of these batik makers join in group (Kelompok Usaha Bersama / KUB) and some are individuals. However, both KUB and individuals have received guidance for the development of business centers. Coaching is in group management, entrepreneurship, finance, and administration. Apart from that, technical training was also conducted, such as batik production techniques, making motifs, coloring, and the finishing stage. The process of making these products certainly has dangers and risks arising from the work process.

The process of making batik both manually and stamped cannot be separated from the dangers that can cause health problems or work accidents (Hunga, 2014). Health problems were found among batik workers in the form of lung capacity problems 67.5%; decreased visual function 33.8%; dermatitis of the extremities 30%. Distribution of workers with impaired lung capacity, decreased visual function, and dermatitis of the extremities found at the sticking stage of the wax, respectively 64.8%; 48.1%. The process of making hand-written batik using wax has the potential to release CO/carbon monoxide. This is in line with Darmiyanti et al. (2003), that said the Batik workplace has been contaminated with CO and making the risks for health workers. The research showed that the Batik workroom has a higher concentration of CO than the standard. Rahmayanti et al. (2020), said that in Batik coloring using naphthol in their dyes. This dye is a non-biodegradable organic compound, so it is complicated to degrade in nature. So, batik workers need to use Personal Protective Equipment (PPE). PPE helps ensure that individuals are safe from physical hazards that

they may encounter in their work environment. PPE may be used to protect workers from general environmental threats (temperature extremes, noise), specific work-related threats (falling objects, falls from heights), or threats faced in an emergency (hazardous chemical and infectious agents).

The existence of potential hazards and risks in the informal sector Batik Papringan Banyumas causes the need for risk management to prevent or minimize the incidence of occupational accidents and diseases. It can be done in several steps. They are identification of potential hazards and risks, risks assessment, and risks control. The hazard potential identification stage is where are reviewed and identify the potential hazards that can impact workers, other people in the workplace, guests, and the community around the workplace. Then the identification of the risks that may occur by considering the risks that may cause loss to property, society, and the environment. Furthermore, a risk assessment is carried out by calculating the likelihood of the risk and the severity or impact of the risk, whether the risk results in an occupational accident or disease. It can be done by considering the possible duration of exposure, the timing of the accident, avoiding or limiting the hazard. While the identification of the severity or impact can be done by considering the nature of the condition or situation to be protected, its effects on health, and the extent of the possible hazards to be caused. The last stage is risk control so as not to or reduce the possibility of accidents and occupational diseases (International Labor Organization, 2013). Hazard and operability study (HAZOP) is applied to identify the hazards potential and risk in the workplace by determining the score in the workplace from likelihood and consequences score. The HAZOP sheet is the most suitable to know the risks because it suggests a systematic analysis method of operator safety (Choi et al., 2020). Based on the description of the potential hazards and risks in the informal sector workplace environment, Batik Papringan Banyumas led to research on "Analysis of Occupational Accidents and Diseases using the HAZOP Method on Papringan Batik Workers, Banyumas Regency" is important to do.

Method

The variables to be studied were the characteristics (age, years of service, and education), the process making, the hazards, the risk of work accidents and occupational diseases, the likelihood, the consequences score, and risk control. This type of research is a mixed method. The research design used a sequential explanatory design by collecting and analyzing qualitative data first and then analyzing the quantitative data obtained based on qualitative data (Bowen et al., 2017). The population in this study were all Kelompok Usaha Bersama and Batik Papringan home industry workers. The population in this research is 200 workers of Batik Papringan. The sample of this research is 190 workers of Batik Papringan. The technique sampling used in this research is a purposive sampling that is determined by inclusion and exclusion criteria. The sample inclusion criteria are Batik Papringan workers who were still actively working when the study is done. The exclusion is workers who switched professions from Batik to another. So, based on purposive sampling (using inclusion and exclusion criteria) is obtained 190 workers as the sample. The research instrument used in this study is HAZOP worksheets. HAZOP consists of many kinds of hazards and risks in the workplace that we observed, Likelihood (L) and Consequences (C) score that determined by the case of a work accident or occupational diseases. The quantitative data that obtained from L and C score is analyzed by univariate analysis. The univariate analysis is done by multiplying the score of L and C in HAZOP worksheets. University of New South Wales (2008) said that HAZOP is an instrument to measure the risk in the workplace by multiplying the score of L and C. The score of L and C is determined by the indicator that described in Tables 1 and 2. After we knew the highest score of multiplication result, we can determine the most priority case of a work accident or occupational diseases to control. There is no validity and reliability analysis because the HAZOP instrument does not consist of some questions. But it consists of guidelines for scoring Likelihood (probability) and Consequences (severity) of a work accident or occupational disease. Table 1 and Table 2 are the description of Likelihood and Consequence to fill HAZOP worksheets.

Table 1. Likelihood (L) Criteria

Score	Criteria	Description
1	Rarely occurs	<1 time every 10 years
2	Less likely to occur	1 time every 10 years
3	Maybe	once every 5 years or once every year
4	Most likely every month	once every year or once every month
5	Almost certain	> 1 time every month.

Source: University of New South Wales (2008)

Table 2. Consequence Criteria (C)

Score	Criteria	Description
1	Insignificant	Does not cause lost work days
2	Small	Can still work on the same shift
3	moderate	Missing work days <3 days
4	Weight	Loss work days 3 or more days
5	Disaster	Lost work days forever

Source: University of New South Wales (2008)

Table 3. Age and Education Distribution of Batik Workers, Papringan, Banyumas who are Members of KUB and Home Industry

Variabel	Category	Frequency	Percentage (%)
Age	15-25	9	4,74
	26-35	23	12,11
	36-45	65	34,21
	46-55	56	29,47
	56-65	23	12,11
	66-75	13	6,84
	76-85	1	0,53
Education	Not graduated of Elementary School	4	2,11
	Elementary School	140	73,68
	Junior High School	31	16,32
	Senior High School	15	7,89
	Bachelor Degree	0	0,00
	Not graduated of Elementary School	4	2,11
Total		190	100

Source: Primary Data Research, 2020

Result and Discussion

The people in Papringan District, Banyumas Regency, have long been engaged in batik activities. This batik activity is a hereditary activity from the previous family. Based on the results of interviews conducted by researchers to Batik Papringan workers, both those who are members of Kelompok Usaha Bersama (KUB) or those who do not join the KUB (home industry workers). Based on the research results, it was found that 20 workers entered the KUB and 170 workers in the batik home industry. All Batik Papringan Banyumas workers, both who are members of the KUB and those who are not, are all female workers.

Based on observations made by researchers, the batik made by KUB at the time of the research was written batik. The researcher observes several Pringmas KUB batik makers who loaded the Batik Tulis from beginning to end. The making of written batik at KUB Pringmas consists of several stages. First, draw a pattern on the cloth. The first stage in making Pringmas Batik Tulis is drawing a pattern on the cloth. The pattern is made using a pencil. The batik maker draws a pattern (motif) on the cloth that has been treated. The pattern is made according to the wishes or inspiration of the batik maker. Second, drawing uses canting. This stage is the stage where the batik maker draws (batik) using wax over the pattern that has been drawn on the cloth. The mori cloth is stretched in the gawangan. The cloth is made using a canting containing hot wax. Hot wax heated in a small skillet. The heat source used to heat the candles comes from a gas stove or firewood. Warm up the candle using low heat. The batik process requires a lot of accuracy and time. Third, coloring (bironi). Pencoletan (bironi) is the activity of giving color to the cloth that has been batik using rattan or a brush. The desired color is following the creativity of the batik maker. Fourth, basic coloring. The basic coloring is the coloring on the part that is not covered by wax. The basic color of the fabric is adjusted to the desires of the consumer or the batik. Fifth, drying. After the fabric has been dipped in the base color, let it dry in the sun. The drying is carried out by the batik at KUB in the morning at 08.00 WIB. Sixth, recoloring. The dry cloth is dipped back into color. Seventh, removal of wax from fabric. The next process is to remove wax from the fabric by putting the cloth in a furnace filled with hot

water. The process of removing wax is carried out repeatedly according to the complexity of the motif and the number of colors on the fabric. Eighth, rining. After the cloth is clean from wax and dry, the batik process is carried out again by making filler. Ninth, spotting. Spotting (pelorotan) aims to remove the wax layer by boiling the cloth in a stove filled with hot water so that the motif is clearly visible. Tenth, washing and drying. After boiling, the cloth is washed in cold water and dried.

Research on workers who are members of the Pringmas KUB was conducted on ten people. The ten batik makers at KUB Pringmas carry out all stages of the batik-making process from start to finish. However, different things are done by batik makers who are not part of the Pringmas KUB or known as home industry batik. Home industry batik is a batik that works on batik in their own homes. Home industry batik makers do their batik directly at the rining stage. They take the cloth from another place that already has a pattern or motif, so the batik only gives filler or dots on the cloth. Then for the next stage, it is sent back to the producer where they took the fabric. Home industry batik get wages from the producers which are calculated per cloth screened. The number of batik home industry who did the screening in this study was 180 people. The rining process carried out by the batik home industry is no different from the rining carried out by the batik makers, who are members of the KUB.

The process of making written batik by batik members who are members of the KUB and batik home industry has potential hazards and risks allowing work-related accidents and diseases. The potential hazards posed by this batik activity include physical, chemical,

Table 4. Risks Arising from The Batik Making Process by Batik Makers Who are Members of KUB And The Home Industry

Hazards	Kind of Hazards	Risks
Physics	Less illumination	Eye fatigue (watery eyes, red eyes, headaches, decreased eye acuity (double vision), decreased concentration and thought speed, decreased speed of work
	High temperature in room	Dehydration, discomfort, tiredness, lack of focus, stress
	High temperature from sunlight	Dehydration, discomfort, fatigue, lack of focus, stress, heat edema (swelling of the hands and feet), heat cramps (spasms of the muscles in the arms, legs or stomach), heat syncope (dizziness that occurs suddenly when changing from a sitting position to standing up), heat exhaustion (anxiety, fainting, excessive sweating), heat stroke (heat buildup characterized by fatigue, pupil dilation, decreased concentration, and confusion)
	High humidity in workplace	Increase the growth of fungi, actinomycetes, Streptococcus bacteria and others
	Less ventilation	Increases body moisture thereby increasing the risk of bacterial growth in the body
	Floor stiiil from soil	Increase the risk of pulmonary tuberculosis because it increases the growth of the bacteria Micobacterium tuberculosis
Chemical	Exposure to chemicals derived from wax, chemicals from fabric dyes and dust from wood	Pulmonary function disorders, contact dermatitis, vision
Biology	Workplace close to pet kennels	Acute Respiratory Infection (ARI), worms, itching Attack of wild animals such as snakes and scorpions
Ergonomic	A work place that is close to nature	Fatigue, musculoskeletal disorders (low back pain, pain in the arms, neck, waist, thighs, calves, legs and shoulders), Carpal Tunnel Syndrome (CTS)
	A bent sitting posture and a static work position	
	Workplace don't implement 5R	Decreased work effectiveness and efficiency, poor product quality, increased confusion, decreased work speed, increased fatigue, decreased work comfort, slipped or fell
	Not using PPE	Increasing the risk of ARI due to exposure to chemicals from wax and dust due to not wearing masks, increasing the risk of contact dermatitis due to chemical exposure from fabric dyes due to not wearing gloves, wearpacks, red and watery eyes due to exposure to wax smoke and firewood dust the result of not using google safety
Psychology	Anxiety about decreased income due to decreased demand for batik products due to the COVID-19 pandemic, saturation, high workloads	Work stress, fatigue, headaches, decreased immunity

Source: Primary Data Research, 2020

Risk is the possibility of accidents and losses at a particular time (Rudi, 2007). Risks need to be assessed to determine which risks are a priority to control. Tarwaka (2008) states that

the risk can be calculated by multiplying the severity level (severity/consequences), denoted by "C" and the level of frequency (likelihood) of the occurrence of the risk, by "L".

Table 5. Frequency, L (Likelihood), C (Severity / Consequences), Risks, and Occupational Accident and Disease Risk Categories of Papringan Batik Workers Joining KUB and Home Industry

No.	Hazard	Risk	Frequency	L	C	Risk (L*C)	Color	Risk Category
1.	Less illumination	Eye fatigue (watery eyes, red eyes, headaches, decreased eye acuity (double vision), decreased concentration and thought speed, decreased speed of work	160	5	1	5	Red	High
2.	High temperature in room	Dehydration, discomfort, tiredness, lack of focus, stress	50	5	1	5	Red	High
3.	High temperature from sunlight	Dehydration, discomfort, fatigue, lack of focus, stress, heat edema (swelling of the hands and feet), heat cramps (spasms of the muscles in the arms, legs or stomach), heat syncope (dizziness that occurs suddenly when changing from a sitting position to standing up), heat exhaustion (anxiety, fainting, excessive sweating), heat stroke (heat buildup characterized by fatigue, pupil dilation, decreased concentration, and confusion)	15	5	1	5	Red	High
4.	High humidity in workplace	Increase the growth of fungi, actinomicetes, Streptococcus bacteria and others	137	5	1	5	Red	High
5.	Less ventilation	Increases body moisture thereby increasing the risk of bacterial growth in the body	76	5	4	5	Red	High
6.	Floor stiel from soil	Increase the risk of pulmonary tuberculosis because it increases the growth of the bacteria Micobacterium tuberculosis	17	5	2	10	Red	High
7.	Exposure to chemicals derived from wax, chemicals from fabric dyes and dust from wood	Pulmonary disorders, contact dermatitis, vision	190	3	4	12	Purple	Extreme
8.	Workplace close to pet kennels	Acute Respiratory Infection (ARI), worms, itching	17	5	1	5	Red	High
9.	A work place that is close to nature	Attack of wild animals such as snakes and scorpions	15	1	4	4	Red	High
10.	A bent sitting posture and a static work position	Fatigue, musculoskeletal disorders (low back pain, pain in the arms, neck, waist, thighs, calves, legs and shoulders), Carpal Tunnel Syndrome (CTS)	190	5	4	20	Purple	Extreme

11.	Workplace don't implement 5R	Decreased work effectiveness and efficiency, poor product quality, increased confusion, decreased work speed, increased fatigue, decreased work comfort, slipped or fell	175	5	3	15	Purple	Extreme
12.	Not using PPE	Increasing the risk of ARI due to exposure to chemicals from wax and dust due to not wearing masks, increasing the risk of contact dermatitis due to chemical exposure from fabric dyes due to not wearing gloves, wearpacks, red and watery eyes due to exposure to wax smoke and firewood dust the result of not using google safety	190	5	2	10	Red	High
13.	Anxiety about decreased income due to decreased demand for batik products due to the COVID-19 pandemic, saturation, high workloads	Work stress, fatigue, headaches, decreased immunity	190	3	1	3	Yellow	Low

Source: Primary Data Research, 2020

Table 5 shows that the risks in the extreme category are the risks caused by three potential hazards in the form of exposure to chemicals from wax, chemicals from cloth dyes and dust from wood, bent sitting posture, and static work positions. It is shown in purple in the UNSW Health and Safety (2008), matrix. In addition, the high risk is caused by nine potential hazards. They are inadequate lighting, high indoor temperature, high temperature due to hot sunlight, humid workplaces, insufficient ventilation, floors that are still from the ground, workplaces that are close to the pet cage, and do not wear Personal Protective Equipment (PPE). The low-risk category is caused by the potential danger in the form of anxiety due to decreased income caused by the COVID-19 pandemic.

The potential hazards giving rise to the most extreme to low risk are known. Therefore, it is necessary to control it. The potential

hazards exist around the work environment of Batik Papringan workers, both those who are members of KUB or those who are not affiliated or home industry in their respective homes. Risk control is carried out based on Peraturan Kementerian Tenaga Kerja RI No.5 of 2018 concerning Occupational Safety and Health at the Work Environment. The regulation states that control of the work environment can be done through elimination, substitution, technical engineering, administrative, and Personal Protective Equipment (PPE). Risk control according to Peraturan Kementerian Tenaga Kerja RI No.5 of 2018 concerning Occupational Safety and Health in the Work Environment, is carried out by looking at the types of potential hazards that cause these risks. The following is risk control that can be done for Batik Papringan workers, Banyumas by looking at the potential hazards that exist:

Table 6. Control of Accident and Occupational Disease Risks Based on Potential Hazards in the Work Environment of Batik Papringan Workers, Banyumas

No.	Hazards	Risk Control
1.	Less illumination	Engineering control (using additional lighting or lamps), opening the windows of the workplace
2.	High temperature in room	Engineering control (open vents and windows)
3.	High temperature from sunlight	Engineering control (working in a shaded room where there is no direct sunlight)
4.	High humidity in workplace	Engineering control (opening vents and windows)
5.	Less ventilation	Engineering control (opening the doors of the workplace, creating additional ventilation and windows that let in sunlight)
6.	Floor still made of soil	Substitution (Replacing the floor with ceramics)
7.	Exposure to chemicals derived from wax, chemicals from fabric dyes and dust from wood	Personal Protective Equipment/PPE (Using PPE in the form of masks, gloves, boat safety, safety glasses, and wearpacks)
8.	Workplace close to pet kennels	Engineering control (Positioning the cage in a place away from the workplace)
9.	A work place that is close to nature	Engineering control (Creating a special room for batik)
10.	A bent sitting posture and a static work position	Engineering control (Making an ergonomic chair for batik, stretching muscles every 2 hours)
11.	Workplace don't implement 5R	Engineering control (Making an ergonomic chair for batik, stretching muscles every 2 hours)
12.	Not using PPE	Engineering control (Making an ergonomic chair for batik, stretching muscles every 2 hours)
13.	Anxiety about decreased income due to decreased demand for batik products due to the COVID-19 pandemic, saturation, high workloads	Administrative control (Controlling anxiety by doing hobbies, exercising, socializing with enthusiastic and optimistic people, increasing spirituality, recreation)

Source: Peraturan Menteri Ketenagakerjaan No. 5 Tahun 2018 (Kementerian Ketenagakerjaan RI, 2018)

The results showed that the Batik Papringan workers, Banyumas had a lot of potential dangers and risks. Risks that arise can be in the form of work accidents or occupational diseases. Work accidents that occur are only caused by not implementing the 5R (Ringkas, Rapi, Resik, Rawat, Rajin) around the work environment. When the research was carried out, it was seen that a lot of unnecessary items in the place (area) used for batik were still scattered and prevented workers from accessing work. Additionally, a slippery workplace runs the risk of causing workers to slip or fall. 5R is learning to manufacture in a clean, sorted, organized, and providing necessary improvement in the workplace (Shaik et al., 2015). The work area is not tidy, there is a puddle of water which causes the floor to be slippery, and the work area has scattered tools, items, or materials that can cause slips or falls. The implementation of 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke)

or 5R in Bahasa Indonesia, give the significant difference improvement in small scale casting industry. Batik Papringan workers also said that they almost slipped or fell, especially when soaking the cloth in a stove filled with dye. Therefore, implementing 5R needs to be done in a disciplined manner in the work area of Batik Papringan workers as a form of controlling the risk of work accidents such as slips or falls.

Apart from the risk of work accidents, Batik Papringan workers also have other risks, including occupational diseases. The occupational disease risks for Batik Papringan workers include eye fatigue, watery eyes, headaches, and decreased concentration. It is due to the work area not implementing the 5R. The results showed that 175 workplaces, both in the KUB and home industry area, did not apply the 5R. The work area of Batik Papringan workers still looks scattered, untidy, unclean, and unkempt. It causes workers to

experience a decrease in work effectiveness and efficiency, product quality is not optimal, increase confusion, reduce work speed, increase fatigue, and reduce work comfort. It is in line with (Ghodrati & Zulkifli, 2013), who said that implementing the 5R culture achieves continuous improvement and higher performance. The research shows that in the governmental section, there is an improvement of about 63% and in the private section, of about 51%. The applicable 5R concept is to sort the items that are not needed while working so that the items needed are around the work area. Place them in their containers and label the containers. It will make the items needed easier to find so as not to cause confusion and work faster. Implementing 5R have many advantages such as using workplace better, preventing losing tools, increasing efficiency, saving time in searching things, improving working condition, decreasing machine maintenance, reducing absentees workers, increasing morale and awareness.

The results showed a high temperature in the room, namely as many as 50 work areas for Batik Papringan workers and sun exposure as many as 15 work areas. It causes the Batik Papringan workers to experience dehydration, discomfort, fatigue, lack of focus, and stress. According to Popkin et al. (2010), people must be avoided from excessive room temperature while working to prevent dehydration which can result in headaches, muscle weakness, and digestive disorders (nausea and vomiting). Workers are exposed to high room temperatures due to lack of ventilation or during batik activities using canting or removing wax from cloth. When making batik with canting, workers are exposed to the heat of the fire from the stove and firewood. It also happens when workers remove wax from cloth. It is in line with Pereira et al. (2020), stated that if a work area does not have adequate ventilation, it will cause oxygen levels in the room to decrease and carbon dioxide levels to increase. It causes the humidity and room temperature to increase. Lack of indoor ventilation can also make it easier for bacteria and viruses to grow. Risk control that can be done is by making adequate ventilation. So that air circulation can run properly and the temperature in the room is

not high. In addition, workers who are exposed to direct sunlight can hydrate their bodies by consuming enough water when working, especially when drying batik cloth. It is in line with Zhang et al. (2019), said that dehydration has a negative impact, namely reducing memory and concentration and resulting in fatigue. Therefore, control that can be done is rehydration by consuming enough water while working.

The results showed that the work area used for batik was humid for 157 workers. It is caused, among others, by the by the unpiled floor and insufficient lighting and ventilation. The work area also looks dark with little lighting. Humid work areas are at risk of causing various occupational diseases such as upper respiratory infections. It is in line with Kullmann et al. (2008), who states that high humidity, low temperature, and sunshine are associated with the risk of several respiratory diseases.

The results showed exposure to chemicals from wax smoke and dyes used when soaking the batik cloth in a fire stove. It results in exposure to chemical waxes and fabric dyes to the workers' breathing and skin. In addition, exposure to chemicals from dyes or wax is a potential hazard that causes the extreme risk to Batik Papringan workers. Risk control needs to be prioritized. The results showed that all workers (as many as 190 workers) were exposed to chemical wax and fabric dyes because they did not use Personal Protective Equipment (PPE) while working. Whether they were masks, gloves, safety goggles, boat safety, or wear packs. It has the risk of causing occupational diseases such as contact dermatitis and respiratory problems. As many as 67.5% of batik workers in Pekalongan City and 30% of workers had dermatitis. Risk control that can be done according to Peraturan Kementerian Tenaga Kerja RI No. 5/2018 concerning Safety and Health in the Work Environment is to use PPE. PPE can prevent the entry of foreign objects, dust, and chemicals into our bodies provided that the PPE used meets established standards and is used properly, correctly, and continuously.

The results showed a workplace used to make batik close to pet cages or close to nature. A total of 17 batik work areas are close to pet

cages, and as many as 15 batik work areas are close to nature. It is in line with Blum's theory which states that health status is influenced by four factors, namely environment, genetics, behavior, and health services. Good sanitation is an integral part of human-animal housing to prevent and reduce the transmission of diseases from animal to human. The facilities must be clean from animal susceptibility to diseases. Daily cleaning is necessary for cage-free housing (Newburry et al., 2010). Therefore, it is necessary to control risks by positioning the work area away from pet cages and keeping the health protocol. Infectious diseases of animals can enter humans by some processes and transmitted virus, bacteria, or parasite (Atawodi et al., 2013)

The results showed the potential hazards in a bent work attitude and a static position that caused the risk of low back pain to Batik Papringan workers. It is in line with the research of (Suryadi & Rachmawati, 2020), states that there is a relationship between work posture and complaints of lower back pain on partners part of PT X Manufacture Tobacco Product. Therefore, the proper risk control for these potential hazards is the right chair and backrest. Seats should be designed so that they are slightly lordosa at the waist and a little kifosa on the back.

The results showed that all Batik Papringan workers (as many as 190 workers) experienced anxiety due to the decrease in demand for batik. It is due to the COVID-19 pandemic condition. According to Kocalevent et al. (2011), stress is significantly related to subjective fatigue which is characterized by anxiety, tension, discomfort, and not being active at work. Lee et al. (2015), said that job stress, psychosocial stress, and fatigue impact on musculoskeletal symptoms experienced by radiologists. Batik workers in Papringan said they felt sluggish with the state of decline in turnover due to the COVID-19 pandemic causing their income to decline. According to Hawari (2011), sports, worship, recreation, and sleep are some things that can control stress.

Conclusion

The conclusion from this research is the

potential hazards of a bent work attitude and a static work position, exposure to chemicals from wax smoke and batik cloth dyes, and a work environment that does not apply the 5R concept are potential hazards that can pose a hazard risk. Risk control is prioritized for the most part in dealing with the three potential hazards. Then, risk control is prioritized further to potential hazards that pose a high risk, namely insufficient lighting, high indoor temperatures, high temperatures due to hot sunlight, damp workplaces, inadequate ventilation, floors that are still from the ground, workplaces that are close to pet cages and do not wear Personal Protective Equipment (PPE). Suggestion for research is to be able to analyze the condition of the vital capacity of the lungs in workers due to exposure to chemicals from wax smoke and dyes.

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