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Proposal for Prevention of Occupational Disease Risk Using the Hiradc Method at PT X in the Dyeing Department

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Abstract. People in this era have various needs in carrying out life. The needs that need to be used by the community have multiple kinds of things, such as clothing. Clothes used by the community go through various processes before becoming finished goods. Before becoming ready-to-wear, clothes came from raw materials such as fabric rolls. There are multiple production processes, such as yarn, fabric, chemical dyeing, etc. One of the places where fabrics are produced is textile factories. A textile factory is a company that produces products in the form of fabrics. The manufacture of fabrics that occur in textile factories must involve mixing chemicals so that the fabric has good quality. The process of mixing these chemical substances involves workers, and the chemical substances used are classified as Hazardous and Toxic Materials (B3), so these chemicals can have a bad impact on their workers if there is physical contact with the worker's body. Exposure to chemicals in the worker's body will cause a risk of developing Occupational Diseases (PAK). Therefore, in this study, data will be processed to prevent workers' risk of Occupational Diseases (PAK) using the HIRADC (Hazard Identification, Risk Assessment, and Determining Control) method. The proposal given in this study is a proposal for the use of Personal Protective Equipment (PPE) and Standard Operating Procedure (SOP) for preventive measures against Occupational Diseases (PAK) for workers

Keywords: HIRADC, Occupational Health and Safety (K3), Occupational Diseases (PAK)

INTRODUCTION

People in this era have various needs in carrying out life, one of which is clothing. Clothes used by the community go through various processes before becoming finished goods. Clothes, before becoming ready-to-wear items, came from raw materials such as rolls of fabric. There are various processes in producing fabrics, such as yarn making, fabric making, chemical dyeing, etc. A textile factory is a company that produces products in the form of fabrics. And its derivatives. The process of making fabrics that occur in textile factories must involve mixing chemicals so that the fabric has good quality. Mixing these

chemicals uses chemicals classified as B3 (Hazardous and Toxic Materials) and can have a bad impact on workers.

According to Sukapto (2019), incidents in the work environment can be categorized into two, namely Work Accidents (KK) and Occupational Diseases (PAK). Based on OSHA (*Occupational Safety and Health Administration*), a work accident is an unwanted event that results in physical injury, health damage, or death to workers. Meanwhile, according to OSHA (*Occupational Safety and Health Administration*), Occupational Diseases (PAK) are diseases caused by exposure to harmful factors in the workplace, such as chemicals, dust, powders, gases, and smoke. PAK can occur due to long-term exposure or very high brief exposure to hazardous materials or working conditions. The impacts caused by Work Accidents and Occupational Diseases have various types ranging from mild, moderate, and severe impacts. The impact of PAK on workers for 6 to 12 months continuously will cause permanent diseases, such as respiratory disorders (Sukapto, 2023). PT X is a textile factory that produces fabrics and its products, namely polyester, cotton, knitted fabrics, and others. One of the processes used in making dyeing fabrics is chemical substances such as hydrogen peroxide, sodium hydroxide, and others. These chemicals are categorized as B3 and can have a bad impact on the human body if there is contact with the worker's body. Adverse effects that can be produced include skin irritation, respiratory tract irritation, shortness of breath, and swollen lungs.

This research was conducted in the DF (*Dyeing Finishing*) Department which carried out the fabric dyeing process using chemicals. The number of employees in the DF Department is 127 employees who work and are divided into 3 *work shifts* . Each *work shift* has 17 to 18 people working. The working process in this department is the compounding of chemical substances for use in the fabric dyeing process. The results of observations in DF (*Dyeing Finishing*) found negligence committed by the operator, such as not using clothes that were following standard work standards. Then, interviews were conducted to find out what impacts the operator felt due to the negligence carried out. The following is the data on the results of interviews with operators that have been conducted.

Table 1 is the results of interviews that have been conducted with 15 operators working in the DF Department. The complaints obtained by operators during daily work are in the form of operators often experiencing skin irritation due to exposure to liquid chemicals classified as PAK because it is caused by exposure to harmful factors in the workplace to workers.

Table 1 Interview Results Data

Data on Occupational Disease Interview Results DF			
Kind Complaints	Level Frequency	Reason	Sum Sufferer
Eye Red	Often Happen	Exposure to Chemicals in the form of Powders Flying in the Air	5
Irritation Skin	Often Happen	Exposure to Liquid Chemicals	15
Respiratory Disorders	Infrequently Happen	Exposure to Chemical Substances in the Form of Inhaled Gases	3
Other	Infrequently Happen	Exposure to Chemical Substances (Powder/Gas/Liquid)	5

To improve this work system, the HIRADC (*Hazard Identification, Risk Assessment, and Determining Control*) Method will be used to provide appropriate improvements related to Occupational Health and Safety (K3) in the work environment. The HIRADC method has a series of processes in identifying hazards in activities or work processes that are routinely and non-routine (Ramadhan, 2017). Advantages of the HIRADC Method There is a process of identifying hazards, assessing risks, and determining appropriate controls to reduce or eliminate these risks. It emphasizes that control measures are the result of risk assessment.

After conducting initial research, the following problem formulation can be carried out.

1. What are the potential for Occupational Diseases (PAK) identified from work in the DF (*Dyeing Finishing*) Department?
2. What efforts can be made to reduce the potential for Occupational Diseases (PAK)?

LITERATURE

Textiles are materials made from natural or man-made fibers that go through a series of processes, such as washing, bleaching, dyeing, printing, or finishing, to make a final product, such as fabric, knitted fabric, or non-woven fabric. Textiles are materials made to produce various kinds of fabrics and can be processed into various kinds of finished products (Stephen F. Boucher, 2011).

Occupational Illness is defined as a disease caused by exposure to risk factors in the workplace and occurs as a result of work or activities performed. PAK can be acute or chronic and develop over time due to repeated or continuous exposure (*World Health Organization*, 2023).

Occupational Diseases (PAK) are caused by work and/or the work environment. Occupational diseases are diagnosed and determined through seven diagnostic steps which include determining clinical diagnosis, identifying the exposure experienced by workers in the workplace, determining the relationship between exposure and clinical diagnosis, the magnitude of exposure, whether there are factors of the individual at play, ensuring that there are no other factors that affect outside the main job, and finally determining the diagnosis of occupation (Ministry of Health, Directorate General of Health Services, 2022).

Occupational Health and Safety (K3) involves efforts to identify, evaluate, and control occupational risks. In his book, David L. Goetsch highlights the importance of training, monitoring, and supervision in the work environment to create a safe work environment (2021).

Occupational Health and Safety (K3) involves efforts to create a safe and healthy work environment for all workers. These include risk identification, accident prevention, health promotion, and policies that support employee welfare (John M. Ivancevich and Michael T. Matteson, 2007).

The HIRADC *(Hazard Identification, Risk Assessment and Determining Control*) method is a series of processes for identifying hazards in activities or work processes that are carried out both routinely and non-routinely (Ramadhan, 2017).

The HIRADC method is used to identify the level of occupational risk that can occur and to provide preventive measures so that workers do not contract Occupational Diseases (PAK). The method has several stages; the following are the stages carried out (Saputro et al., 2021).

Data Collection And Processing

This section will discuss the data collection carried out during observations at the DF Department. We will also discuss the processing of data derived from the collection of data owned. Then, we will discuss the proposed improvements that can be made.

Data Collection

Data collection results from initial research observations on research objects that are well arranged to provide information related to the object observed to be researched. Data

collection is carried out by observing the way operators work in DF, which has potential hazards and impacts. There are two observation results, namely for Negative HIRADC and Positive HIRADC. Negative HIRADC has data on potential hazards when carrying out work activities, while *Positive HIRADC* has positive opportunity data that is carried out to be applied to the work environment.

Negative Hiradc Data Collection

The data collection for HIRADC Negative comes from observations during the operator's work activities. This data collection is useful to find out the potential hazards of the work carried out by the operator. The processes in DF are the chemical compounding process for the fabric dyeing process, the installation of fabrics in the jigger machine, the fabric dyeing process in the jigger machine, and the drying process in the jet dyeing machine. There are several locations in the DF Department where operators can carry out their work activities.

Figure 2 Drug Warehouse

Figure 3 Jigger Machine

Figure 2 of the Drug Warehouse shows the working environment in the DF Department's drug warehouse. The warehouse is where operators mix various chemicals to produce drugs on fabrics. The drug is then mixed in the Jigger Machine. Next, a picture of a jigger machine for the fabric dyeing process is shown.

In Figure 3, the jigger machine can be seen to exist from the jigger machine. A jigger machine is a machine for mixing chemicals on fabrics. This process is important so that the

fabric has good quality. Then, after the dyeing process, it will continue to the drying process in the Jet Dyeing Machine.

Figure 4 Jet Dyeing Machine

The Jet Dyeing machine is used to dry the fabric after the dyeing process in the jigger machine. The operator inserts the wet cloth and carries out the drying process. When the fabric has dried, it is transferred to another department for different processes. The results of observations on each machine can be seen in Table 2.

Table 2 Negative HIRADC Data Collection

It No	Potential Hazards
1	The skin and eyes can be exposed to chemicals in the drug warehouse when taking and compounding chemicals.
2	The operator can inhale gases derived from chemicals that are in the drug warehouse when taking and compounding chemical substances
3	The skin can be exposed to medicinal chemicals when you want to insert drugs that have been formulated into Jigger machines
4	Skin exposed to hot water while doing work on a Jigger machine.
5	The operator can slip when trying to move the fabric coming from the jigger machine to the *jet dyeing machine.*

Positive Hiradc Data Collection

Positive HIRADC data collection is an opportunity that can be done in the work environment and can benefit operators and companies. The identification process involves

looking at potential opportunities that the company can apply to the work environment. The results of identifying potential opportunities can be seen in Table 3.

Table 3 Collection of *Positive* HIRADCs

It	Potential Opportunities
1	Bookkeeping of activities carried out at DF
2	Control the work process carried out by the operator.
3	Providing K3 training
4	Providing PPE facilities that have excellent quality
5	Caring for PPE used by operators

Table 3 of Positive HIRADC Data Collection shows the results of collecting data on opportunities in the DF work environment. The table shows several opportunities that can have a positive impact. Furthermore, data processing will be carried out to process data on opportunities that have been owned.

Data Processing

In this section, data processing will be carried out based on the data that has been owned. The data was processed using the HIRADC (Hazard Identification, Risk Assessment, and Determining Control) method.

Hazard Identification

The first step in processing the HIRADC Negative data that has been collected is to identify hazards. Hazard identification is carried out to determine what impacts can be caused when operators carry out work activities at DF. The following are the results that provide the impacts that can be caused by activities in the DF Department.

Table 4 Hazard Identification identifies problems with potential hazards from the operator's work activities. Hazard identification is carried out by determining the impact of exposure to chemicals on the body and the impact if a potential hazard occurs to the operator. It is known that the hazards that arise can be detrimental to operators in terms of health. So, it is necessary to carry out the next stage, namely risk assessment, to determine the level of the risk value matrix.

Table 4 Hazard Identification

No	Potential Hazards	Hazard Impact
1	Skin and eyes can be exposed to substances chemicals in drug warehouses when doing Extraction and compounding of chemical substances.	It can be affected by skin irritation, nearsightedness, etc.
2	The operator can inhale the gas that comes from chemical substances that are in the drug warehouse when taking and compounding chemical substances.	It can be affected by respiratory disorders, irritation of the nose, irritation of the respiratory tract, death, etc.
3	The skin can be exposed to drug chemicals when it comes to inserting drugs which have been incorporated into the Jigger machine	Can cause skin irritation, respiratory distress, etc
4	Skin exposed to hot water while doing work on a Jigger machine.	It may cause irritation and burns to the skin
5	The operator can slip when moving the fabric from the jigger machine to the jet dyeing machine.	It can cause pain in the body

Negative Hiradc Risk Assessment (Risk *Assessment)*

The second thing that is done in processing the HIRADC Negative data that has been collected is to conduct a risk assessment. Risk assessment is an activity that provides several values, including the likelihood value, impact value, and matrix. In addition, there is also the lowest or highest level of work activity in the DF. The risk assessment aims to determine the potential value and impact of the hazards that have been identified. This can be helpful when you want to make risk control recommendations. The following are the results of the risk assessment.

Risk analysis techniques are needed to determine the magnitude of a risk. Risk analysis is a technique for determining the magnitude of a risk reflected in the possibilities and impacts caused by the threat and opportunity aspects. The risk value can be determined using the following equation.

Risk Value = Likelihood x Impact **(Pers.1)**

A matrix of possibilities and impacts can help determine which risks require risk response planning. The numerical value in the Risk Value is obtained by multiplying the

likelihood value and impact value to assess the likelihood and impact on the organization. So, it can be done by first making a scale of the index.

Table 5 Likelihood Scale

Index	Value	Likelihood
Very High	0,9	Always Happens
Tall	0,7	Frequent Occurrence
Keep	0,5	Sometimes Happens
Low	0,3	Rare
Very Low	0,1	Very Rare

In Table 5 of the Probability Scale, you can see a scale consisting of an index, value, and probability. The scale can help determine the risk value. The determination of the scale value is likely to be subjectively related to the opportunities that exist in the worker's work. In addition to the likelihood scale, the impact scale is also used. The following is the impact scale used.

Table 6 Impact Scale

Index	Value	Impact
Very High	0,8	Very Costly
Tall	0,4	Major Disadvantages
Keep	0,2	Quite Detrimental
Low	0,1	Minor Losses
Very Low	0,05	Losses are negligible

In Table 6 of the Impact Scale, you can see the index, value, and impact scale. The impact scale is also used to help determine the value of risk. The scale is also used subjectively based on the analysis carried out and statements by workers that can corroborate the reasons for the impact of the work done.

Furthermore, after knowing the scale of possibilities and impact, a risk assessment can be carried out to see the priority of risks that must be handled from the highest to the lowest. In determining the level of risk priority, the probability and impact matrix can be used as a tool in conducting *qualitative risk analysis.*

Table 7 Matrix of Possibilities and Impacts

Likelihood	Threat Risk Value = Likelihood x Impact					Chance High (Red) / Medium (Yellow) / Low (Green)				
0,9 Very Possible	0,05	0,09	0,18	0,38	0,72	Tall	Tall	Tall	Keep	Low
0,7 Maybe	0,04	0,07	0,14	0,28	0,56	Tall	Tall	Keep	Keep	Low
0,5 It could be possible	0,03	0,05	0,1	0,12	0,4	Tall	Tall	Keep	Low	Low
0,3 Impossible	0,02	0,03	0,06	0,12	0,24	Tall	Keep	Keep	Low	Low
0,1 Highly unlikely	0,01	0,01	0,02	0,04	0,08	Keep	Low	Low	Low	Low
	0,5	0,1	0,2	0,4	0,8	Very High	Tall	Keep	Low	Very Low
	Impact									

Table 7 of the Likelihood and Impact Matrix shows that the matrix consists of risk values and risk categories. The matrix is very helpful in determining risk management priorities, making it easier to plan risk control and elimination.

In Table 8 of the Negative Risk Assessment, the risk assessment results of the activities carried out by the operator while working at the DF can be known. Table 7 of the Negative Risk Assessment gives a value in the likelihood and impact column based on the degree of likelihood and impact that can occur to the operator when carrying out work activities. This score was obtained based on the researcher's observations during the observation of work activities in the DF Department. This is done based on research that has been conducted previously (Saputro, 2021). In providing possible impact assessments using the HIRADC method, analysis, and evaluation from observers are needed based on the potential and impact of the hazards that have been identified.

Table 8 Negative Risk Assessment

NO	Potential Hazards	Hazard Impact	Risk Assessment	
			Matrix	Level
1	Skin and eyes can be exposed to chemicals in the drug storehouse	It can be affected by skin irritation, nearsightedness, etc.	0,56	Highest
2	Operators can inhale gases derived from chemicals in drug warehouses	It can be affected by respiratory disorders, irritation of the nose, irritation of the respiratory tract, death, etc.	0,56	Highest
3	The skin can be exposed to drug chemicals when you want to put the drug into the Jigger machine	It can cause skin irritation, respiratory distress, etc	0,56	Highest
4	Skin exposed to hot water while doing work on a Jigger machine	It can irritate and burn to the skin	0,2	Lowest

Then, there is also a matrix value, which is the result of multiplying the possible and impact values. Furthermore, the highest and lowest values of the matrix values that have been obtained are determined. This aims to determine, based on the activities carried out by operators, which activities have low and high levels of danger.

Determining *Control*

The third step in processing Negative HIRADC data is determining control. Control is the process of determining how to control the existing risks so that operators avoid adverse impacts when carrying out work activities.

Control control is an activity that aims to deal with existing risk problems. Control can be carried out gradually, from the highest risk level to the lowest category. Negative risk control is carried out based on a five-stage control hierarchy. The following are the five stages contained in the control hierarchy.

1. Elimination. Elimination is the elimination of hazardous work in the form of tools, processes, machines, or substances with the aim of protecting workers.
2. Substitution. Substitution aims to replace materials, processes, operations or equipment from hazardous to more harmless.

3. *Engineering Control.* This type of control is the most commonly used because it has the ability to change the transmission line of a hazard or isolate workers from hazards.
4. *Administrative Control.* Hazard control by modifying workers' interactions with the work environment, such as work rotations, training, work standard development (SOP), work shifts, and *housekeeping.*
5. Personal Protective Equipment
6. Personal protective equipment is designed to keep you safe and healthy by protecting you from hazards in the work environment and pollutants.

Identify Opportunities

The first step in processing the positive HIRADC data you already have is to identify opportunities. Opportunity identification is an activity that aims to determine the benefits of existing opportunities. The following are the results of the opportunity identification that has been carried out.

Table 9 Opportunity Identification

NO	Potential Opportunities	Opportunity Benefits
1	Bookkeeping of activities carried out at DF	There are traces so that if something goes wrong, you can find the problem point
2	Control the work process carried out by the operator	Increase productivity and prevent operator negligence
3	Providing K3 training	Increase the level of operator knowledge of the importance of OSH
4	Providing PPE facilities that have Excellent quality	Improve the level of occupational safety and health of operators when working
5	Caring for PPE used by the operator	So that the age of the PPE used can last for a long time

Table 9 of Opportunity Identification shows the results of the opportunity identification for the potential opportunities that have been owned. The results of identifying opportunities that have been carried out produce benefits that can be felt if potential opportunities are carried out. The provision of benefits is based on what may be felt if the potential opportunity runs. Furthermore, a risk assessment is carried out to find out how much positive risk value arises from the potential opportunities and benefits of the opportunities owned.

Positive Hiradc Risk Assessment (Risk *Assessment)*

The second step in processing positive HIRADC data is to conduct a risk assessment. This risk assessment is different from the risk assessment for Negative HIRADC because it aims to determine how much benefit can arise. Here are the results.

Table 9 Positive Risk Assessment

NO	Potential Opportunities	Opportunity Benefits	Risk Assessment		
			Likelihood	Impact	Matrix
1	Bookkeeping of activities carried out at DF	There are traces so that if something goes wrong, you can find the problem point	0,9	0,8	0,72
2	Control the work process carried out by the operator	Increase productivity and prevent operator negligence	0,9	0,8	0,72
3	Providing K3 training	Increase the level of operator knowledge of the importance of OSH	0,9	0,8	0,72
4	Providing PPE facilities that have excellent quality	Improve the level of occupational safety and health of operators when working	0,9	0,8	0,72
5	Caring for PPE used by operators	So that the age of the PPE used can last for a long time	0,9	0,8	0,72

In Table 10 of the Positive Risk Assessment, the results of the risk assessment for the potential opportunities can be seen. There is a rating in the likelihood and impact column to determine how useful it is. Then, there is a matrix value, which is the result of multiplying

the possible and impact values to determine the value of the benefits that can arise. Furthermore, control determination will be carried out for the opportunities owned.

Determining *Control*

The third step in processing Positive HIRADC data is to determine the right control for the opportunities that have been owned. Determining control is very helpful in providing proposals that the company needs to make to take advantage of the existing opportunities.

Positive risk control using risk response based on the PMBOK Guide 6th edition, 2017. The PMBOK Guide 6th edition, 2017, has five alternative steps for dealing with positive risks (opportunities). Here are the steps.

1. *Climb.* This strategy is appropriate when the project team or project sponsor agrees that the opportunity is outside the scope of the project or that the proposed response will be beyond the project manager's authority. The project manager determines who should be notified of the opportunity and communicates the details to that part of the organization.
2. *Exploit.* Exploitation strategies can be chosen for high-priority opportunities where the organization wants to ensure that the opportunity can be realized. This strategy seeks to capture the benefits associated with a particular opportunity by ensuring that it is bound to happen and increasing the probability of its occurrence to 100%.
3. *Share.* This strategy involves transferring ownership of the opportunity to a third party, so that this has an impact on the distribution of profits if the benefit of the opportunity occurs.
4. *Enhance.* This strategy increases the likelihood and/or impact of an opportunity. Increasing or adding opportunity benefits early in planning is more effective than trying to increase benefits after opportunities have occurred. Focusing on the cause can also increase the likelihood of an opportunity.
5. *Accept.* This strategy involves accepting opportunities or acknowledging their existence, but no proactive action is taken. It may be appropriate for low-priority opportunities. Reception can be active or passive.

Improvement Proposal

This section will discuss the proposed improvements made by the company to prevent potential work-related diseases that can arise in the company's operators. The improvement proposal is a recommendation given by the researcher to prevent operators from being affected by work-related diseases when carrying out work activities within the DF Department. Two types of proposals will be given: based on the results of the calculation of Negative HIRADC and positive HIRADC and based on researchers.

Proposed Improvement Using The Negative Hiradc Method

In this section, we will discuss proposed improvements using the HIRADC method. The HIRADC method discussed in this improvement proposal results from the calculation of Negative HIRADC. This is because this study aims to prevent occupational diseases in the work environment and the HIRADC Negative method includes information on the impact of hazards on the operator's work activities. The HIRADC method is a method that aims to identify potential hazard risks in the work environment and provide recommendations for improvement to prevent or reduce potential hazards that can arise in the work environment. In the process of using this method, proposals have been produced to help deal with the impact of potential hazards in operator work activities.

In Table 11 Proposed Remediation Using the Negative HIRADC Method, the results of the proposed improvement can be seen in the risk control column when using the HIRADC method. The proposals given in the table aim to avoid disasters that can be experienced by operators while working, namely occupational diseases and work accidents. Knowing the impact of the hazard in which category of disaster it is included can be seen in the monitoring results column. The suggestions can only prevent the operator from experiencing the impact of the existing hazard when the operator implements the proposed improvements received. The proposal in Table 11 of the Proposed Improvement Using the Negative HIRADC Method is included in the fifth stage step, namely the proposal for using Personal Protective Equipment (PPE). This is given because the operator's activities when working cannot be eliminated, chemical substitution, and engineering control. So, a proposal for recommendations using PPE was given. However, there needs to be monitoring so that operators remain consistent in implementing the proposed improvements to avoid the impact of hazards that can arise from work activities.

Table 11 Proposed Remedies Using the Negative HIRADC Method

NO	Potential Hazards	Hazard Impact	Risk Assessment					Risk Control	Monitoring Results	
			Likelihood	Impact	Matrix	Lowest	Highest		Accident	SIR
1	The skin and eyes can be exposed to chemicals in the drug warehouse when taking and compounding chemicals	It can be affected by skin irritation, nearsightedness, etc.	0,7	0,8	0,56		√	Use PPE such as coveralls, protective glasses, and gloves		√
2	Operators can inhale gases derived from chemicals in the drug warehouse while taking and compounding chemicals	It can be affected by respiratory disorders, irritation of the nose, irritation of the respiratory tract, death, etc.	0,7	0,8	0,56		√	Using PPE like a gas mask		√
3	The skin can be exposed to medicinal chemicals when you want to put the drug that has been formulated into the Jigger machine	It can cause skin irritation, respiratory distress, etc	0,7	0,8	0,56		√	Use PPE such as coveralls, protective glasses, masks, gloves, and boots	√	√
4	Skin exposed to hot water while doing work on a Jigger machine	Can irritate and burns, such as blisters on the skin	0,5	0,4	0,2			Use PPE such as coveralls, protective glasses, masks, gloves, and boots		√
5	The operator can slip when trying to move the fabric coming from the jigger machine to the *jet dyeing machine*	Can cause pain in the body	0,5	0,2	0,1	√		Use PPE such as boots	√	

Proposed Improvement Using The Positive Hiradc Method

In this section, we will discuss proposed improvements using HIRADC Positive. Positive HIRADC is a calculation of the HIRADC method to determine the opportunities that can be given to companies in the DF Department. HIRADC Positive can provide suggestions to help address the problems identified in the HIRADC Negative method. A Positive HIRADC will consist of several pieces of information such as potential opportunities, benefits of opportunities, assessment of the risk level the opportunity can help, and opportunity control. This can help in knowing what can be done and the value of the benefits that can be felt.

In Table 12 of Proposed Remedies Using the Positive HIRADC Method, it can be seen that there are potential opportunities that can be done to help overcome the problems identified in the potential hazards in Negative HIRADC. The proposed improvements are in the form of activity bookkeeping to know the history of operators working in the DF Department, controlling when operators work, providing Occupational Health and Safety (K3) training, providing good quality PPE, and caring for PPE. This aims to increase awareness for operators of their health, encourage them to be more careful when working, and avoid occupational diseases (PAK).

Table 12 Proposed Improvements Using the Positive HIRADC Method

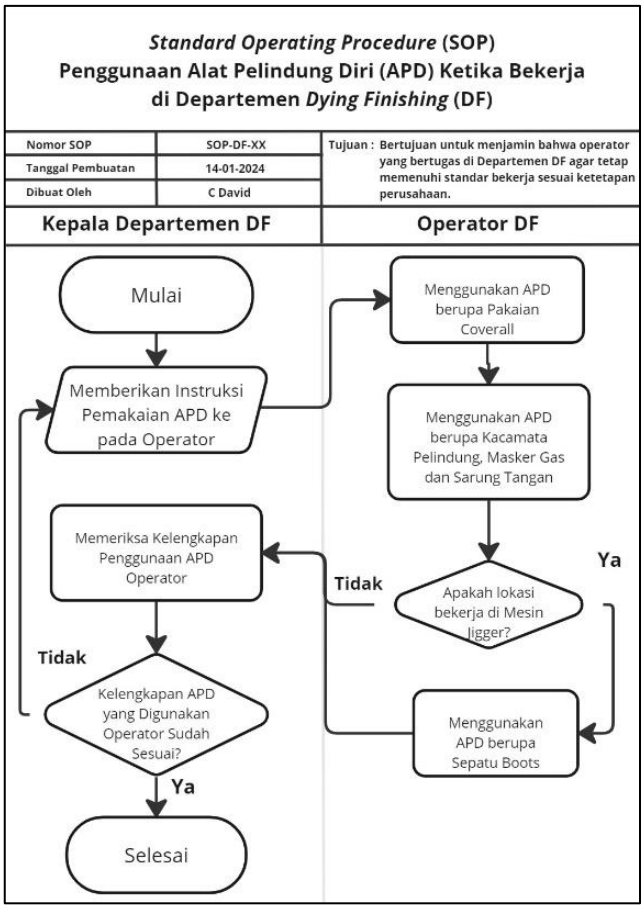
No	Potential Opportunities	Opportunity Benefits	Risk Assessment					Risk Control	Monitoring Results	
			Likelihood	Impact	Matrix	Lowest	Highest		Operator	Company
1	Bookkeeping of activities carried out at DF	There are traces so that if something goes wrong, you can find the problem point	0,9	0,8	0,72		√	Always record the activities carried out at WWTP.	√	√
2	Control the work process carried out by the operator	Increase productivity and prevent operator negligence	0,9	0,8	0,72		√	Always do regular control.		√
3	Providing K3 training	Increase the level of operator knowledge of the importance of OSH	0,9	0,8	0,72		√	Always provide K3 training materials regularly by making a special schedule	√	√
4	Providing PPE facilities that have excellent quality	Improve the level of occupational safety and health of operators when working	0,9	0,8	0,72		√	Pay attention to the inventory and quality of PPE owned by the company.		√
5	Caring for PPE used by operators	So that the age of the PPE used can last for a long time	0,9	0,8	0,72		√	Always clean PPE after use for work	√	

Improvement Proposals Based On Researchers

In this section, there will be a discussion about improvement proposals that can be provided by researchers. This improvement proposal is given to follow up on the improvement proposal developed using the HIRADC method. It is known that the improvement proposals contained in Table 11 of the Proposed Improvement Using the Negative HIRADC Method are only recommendations for using Personal Protective Equipment (PPE). However, there needs to be controls that can keep operators from using PPE under the proposals given. Therefore, other proposals will also be given to keep operators at work still implementing the recommendations for improvement proposals, namely the creation of Standard Operating Procedures (SOPs). In the risk control stage owned by the HIRADC Method, *the Standard Operating Procedure* (SOP) is included in the *administrative control stage*, namely control to keep operators following the applied regulations. Thus, the preparation of SOPs under the needs needed for operators to continue to implement the proposals given in Table 11 Proposals for Improvement Using the HIRADC Negative Method because the preparation of SOPs aims to keep DF operators working under the provisions that have been set by the company. The contents of the SOP will contain information on the stages that need to be carried out when the operator wants to work in the DF Department.

In Figure 5 *of the Standard Operating Procedure* (SOP), it can be seen that the proposed SOP is given as a recommendation for improvement. In the SOP, instructions are

given on the stages that need to be carried out by the operator, as well as information about the operator's purpose in using PPE. In addition, there needs to be a punishment given so that if the operator does not comply with the SOP given, a punishment in the form of sanctions will be given. This is given so that operators feel afraid if they do not work according to the SOP because they will be sanctioned. Therefore, the provision of SOPs can follow up on the proposals in the HIRADC method so that operators continue to maintain the implementation of improvement proposals to avoid occupational diseases and work accidents.



Gambar 5 *Standard Operating Procedure* (SOP)

CONCLUSION

The following is the conclusion of the research that has been conducted.

1. Four Potential PAKs can be identified in the Dying Finishing (DF) Department's working environment. Of the five existing potentials, three Potential Occupational Diseases (PAK) have a high-risk value of 0.56. Then, there is 1 PAK, which has the lowest score among other potentials of 0.1 and is included in the medium category.

2. Efforts can be made to reduce the potential of PAK to protect operators against exposure to chemicals, control operators when working, provide Occupational Health and Safety (K3) training to operators, provide excellent quality PPE, maintain PPE, and create SOPs.

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