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Preventive Action to Make Zero Accident for Welding Process

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A B S T R A C T

Each type of work has the risk of being affected by accidents or occupational diseases. These risks cannot be avoided, but can be minimized. Welding uses fire and flammable and explosive materials. Given the importance of Occupational, Safety and Health (OSH) in every workplace to increase work productivity, the implementation of OSH is the responsibility of all parties. Based on observations, many students were absent from lectures due to illness and some were exposed to gram splashes due to welding practices. Therefore, it is necessary to conduct further research on the application of Occupational health and safety culture as an effort to prevent accidents and diseases caused. The purpose of this research is to make procedure of preventive action on welding process. The research methodology consist of literature study, observation, make danger formulation and make critical assessment. The result of this research show that the highest RPN while the operator do welding.

Keywords: Action, Safety, Preventive, Welding, Zero accident.

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1. Introduction

Welding is a machining activity that has many risks both related to work accidents and occupational diseases. Each type of work has the risk of being affected by accidents or occupational diseases. These risks cannot be avoided, but can be minimized. Welding uses fire, flammable and explosive materials. Workplace accidents and diseases can be avoided if the welding operators comply with K3 ethics and are skilled at operating welding equipment well [1].

Considering the importance of OSH in each workplace to increase work productivity, the implementation of OSH is the responsibility of all parties to be applied in the workplace. Aside from being a necessity, in Law No. 1 of 1970 concerning occupational safety and health, explained that K3 is not only applied in the industrial world, but covers all aspects where there is a place to work. According to Law No. 1 of 1970, the laboratory is also a workplace that must be applied K3.

Diploma Study Program of Mechanical Engineering is a Higher Education that is engaged in the vocational field. In order to support student learning and teaching activities, this college has a laboratory and a workshop such as fabrication workshop. The workshop is used for welding practices where there are welding and grinding activities.

Figure 1. Welding Process

The fabrication workshop of this college actually has personal protective equipment used for the practice. These personal protective equipment include welding glasses, safety shoes, masks and aprons. But students are reluctant to comply with K3 ethics in the practice. Based on observations at the fabrication workshop, it is known that almost all students do not use safety shoes, masks, glasses, and aprons. The impact of this is that there are many students who are absent from other courses due to illness and someone who is exposed to a splash of bram. This is supported by the results of interviews from several lecturers where most of the lecturers had received permission not to enter because of complaints of eye pain after the welding practicum. Another lecturer also stated that there was also a permit because the students' eyes were exposed to a splash of bram. After checking the attendance list, it turned out that many students were unable to attend lectures due to illness. Of course this is very disturbing and can cause greater problems later on.

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Therefore, it is necessary to conduct further research regarding the application of K3 culture as an effort to prevent accidents and illnesses.

This study aims to design the prevention of accidents and diseases due to K3 welding practices considering 5S. This research is very much needed, so that accidents and illnesses caused by work when practicum can be minimized, besides that by applying OHS culture according to standards, students will be accustomed to implementing OHS and making it a necessity. Of course this will be very good for their stock to enter the workforce.

2. Research Methodology

The welding process is the process of joining 2 materials using metal melting. Welding is an activity that poses a high danger. The following is the research methodology used in this study

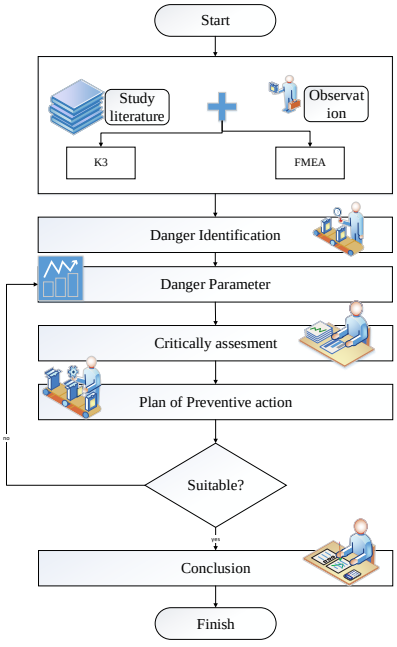

Figure 2. Research Methodology

Hazard identification stage is the stage used to identify any hazards arising from the welding practice process. In addition to hazards, at this stage a risk analysis of the impacts will also be carried out. Meanwhile, the determination of cost parameters is done by giving a scale based on risk, events, and their impact. At this stage it is based on the principles contained in the FMEA (Failure Mode Effect and Analysis).

3. Result and Discussion

Based on observations made at fabrication workshops and literature studies on hazards.

Table 1. Danger Identification

No	Procces	Danger Identification	Danger
1	Use PPE before work	Not use of PPE PPE that is owned is not complete The number of PPE is limited	Splashed welding flame, exposed to welding radiation, electric shock, eye pain, respiratory infections
2	Choose welding position	Welding table is not ergonomic The lighting is not good	Muscle injury due to incorrect position, self-injury, eye pain
3	Preparing cable and tools	Equipment not in a fixed position (move to move as needed and position)	Gravitational to the risk of slipping or tripping over a cable
4	Turn on the engine panel box and adjust the electric current	- cable not maintained (peeled off) -cable position is not neat -wrong method of holding electrodes -Operator is not ready when the electrode is turned on	- electric shock - slip or fall - exposed to sparks - radiation
5	Do the welding process	- Position when welding stand - Welding movement are repeated - Welding gas - Sparks of flammable materials (gasoline, diesel, kerosene, etc) - The cable is chid	- Muscle injuries - Muscle injuries - Respiratory tract infections, sore throat, lung infections - fire - muscle stimulation and pain - extreme pain - muscle contraction so that

No	Procces	Danger Identification	Danger
			victims affected by electric shock cannot escape without the help of others
6	Tidying up the equipment	Equipment security is not installed	Slipping, tripping, messy cables

Critical assessment is carried out by providing an assessment of the parameters of accidents and diseases due to the welding practice by calculating the value of the RPN. The RPN value is used as a benchmark to find out which risks need to be prioritized in planned preventative actions.

Table 2. Calculation of RPN (Risk Priority Number)

No	Procces	S	O	D	RPN
1	Use of PPE	6	7	6	252
2	Choose welding position	6	6	5	180
3	Prepare cable and equipment	5	5	5	125
4	Turn on the engine panel box and adjust the electric current	7	7	6	294
5	Do the welding process	9	8	7	504
6	Tidying up the equipment	4	4	5	80

Based on the table, obtained a sequence of severity values that result in high to low hazards are the welding process, turning on the engine panel box and adjusting the electric current, welding position, use of , preparing cables and equipment, and tidying the equipment.

Meanwhile, the sequence of occurrence values from highest to lowest values, namely carrying out the welding process, turning on the machine panel box and adjusting the electric current, the use of , welding position, preparing cables and equipment, and tidying the equipment.

The order of detection values from highest to lowest values is doing the welding process, turning on the machine panel box and adjusting the electric current, using , welding position, preparing cables and equipment, and tidying the equipment.

The value of Risk Priority Number (RPN) as a result of research on identifying the risk of welding hazard in a row from the highest to the lowest, namely welding process with a RPN value of 504, turning on the engine panel box and adjusting the electric current with a value of RPN 294, using with RPN value 252, welding position with a value of RPN 180, preparing cables and equipment with a value of RPN 180, and tidying up equipment with an RPN value of 80.

Based on the RPN value at the time of critical assessment, the RPN value with high risk is obtained when doing the welding. Preventive actions that can be taken to minimize the occurrence of these impacts by considering the RPN value are as follows

Prevention action of the welding dangers in general:

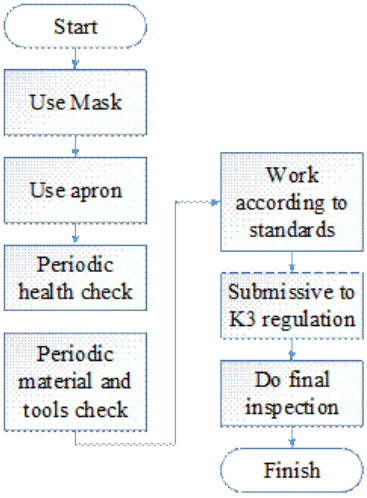

Figure 3. Preventive Action to Prevent Accident

Prevention action of shock due to the welding process takes place are:

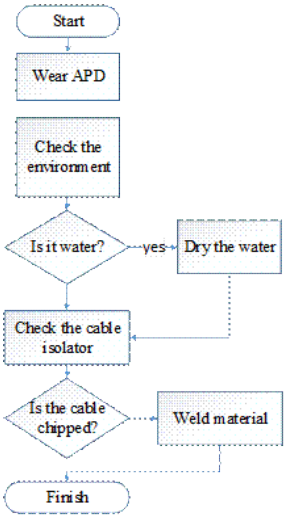

Figure 4. Preventive Action

Based on the OSHA (Occupational Safety and Health Administration), recommendations for the prevention of hazards caused by welding include:

1. Understanding welding material

   In a welding process someone who conducts welding must understand the material used in welding. Because by knowing the material used, it can determine how the welding process is carried out, such as welding preparation, welding process / implementation, and finally finishing.

2. Clean the welding area regularly
   Welding spot cleaning is done to remove all impurities. Where the impurities can be in the form of paint, oil, dust, water etc. Dirt is cleaned to avoid welding damage during welding, and if cleaning is done will cause discontinuity. So that cleaning the welding area is needed to avoid things that are dangerous.
3. Provide air circulation to reduce the high hazardous substances in the welding workshop area
4. Use personal protective equipment () consists of:
   a. Helmet
   b. Safety shoes
   c. Goggles or welding helmets
   d. Hand protection
   e. Apron

4. Conclusion

Prevention of the impact of hazards caused by welding is important to do. Before determining the right handlers to overcome these impacts, a risk analysis using FMEA is needed. FMEA calculation results show that welding activities that pose the highest risk are the processes at the time of welding. To prevent the impact, welder must standard operating procedures in work, use , check the environmental conditions whether it is safe to do welding or not, and periodically check welder health.

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