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Risk Assessment, Risk Management, and Risk Communication of Welding Work at PT Dok and Perkapalan Surabaya (Persero)

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Abstract

PT Dok dan Perkapalan Surabaya Is one of the manufacturing industry sectors in which operational activities can cause accidents and work-related illnesses such as the activities of joining the ship's hull parts, namely the welding process. The risk of welding work needs to be done risk management to determine the prevention of possible work accidents through Risk Assessment activities which are then communicated to all parties. The purpose of this study is to identify hazards, conduct risk assessments and study risk control on welding work. This research is a descriptive study with an observational approach. From the results of the risk assessment of the 3 stages with 7 job descriptions, the percentage of risk categories was obtained, namely high risk 43% and medium risk 57%, and there was no low risk category Control carried out as part of risk management went well but residual risk remained so need a strong commitment from human resources or management and awareness of the workers on the use of personal protective equipment in every work. Risk communication is carried out through coaching or training, conducting safety induction, safety talk, Safety campaigns such as the activity of installing banners, posters, conducting meetings of the Health and Safety Guidance Committee at the end of each month to discuss the problems that occur and make improvements.

Keywords*: Risk Assessment, Risk Management, Risk Communication, Job Safety Analysis (JSA), Welding*

Introduction

In the current era of globalization, it is necessary for advanced technology to meet human needs as a whole, sometimes without us realizing the absence of good control causes harm to humans themselves. In the use of technology it is unavoidable that in the current era of industrialization the transformation process in technology cannot be prevented from developing. With the use of advanced technology, it will affect the increased use of materials that have potential hazards according to current industrial needs. In the use of advanced technology, it will provide convenience for users, but it will also have an unavoidable impact, namely the increase in the number of hazard risks and the variety of sources of accidents for technology users themselves[1].

The East Java Manpower and Transmigration Office claims that there were 21,631 cases of work-related accidents in 2017. That number rose around 200 cases compared to the previous year. While at PT Dok dan Perkapalan Surabaya every year there are still work accidents. In 2010 to 2015 there were a total of 36 occupational accidents with a risk rating of occupational deaths to minor risks[2].

PT. Dok and Perkapalan Surabaya (Persero) is one of the processing industries (manufacturing) of BUMN with international standards, and has main activities including: ship building, steel structure fabrication,

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design & engineering, offshore construction and ship repair & conversion which in each production uses equipment or machinery that has the potential to cause accidents and there are also other potential dangerous and toxic accidents that can cause occupational diseases. As for its operational activities, it covers: welding, cutting steel plates or ship material, lifting iron or heavy equipment ships, assembling ships, installing pipes in ships and other operational activities[3].

The activity of uniting ship blocks is inseparable from welding activities. Welding is the connection of two or more materials based on the principles of the diffusion process, so that a part of the material is joined together. This welding process is very important because to join the hull parts of the ship. Where in the welding process there should not be the slightest mistake whether it is a crack, over heat, and so on. This welding process is a very vital part of the ship building process. The types of hazards that occur due to welding are exposed to ultraviolet and infrared radiation, inhaled fumes that exist in welding, fires, electrocuted. Therefore, to find out what hazards there are in the welding activity and control[1].

The problem faced by companies in this modern era is that there is no comprehensive analysis of all hazard factors in the company so that the control of each hazard factor is often done partially. Thus, to look at the problems in the company in a comprehensive manner, the company's problems must be analyzed in the risk risk analysis. Risk analysis is an effort to analyze all hazard factors in the company based on risk assessment, risk management and risk communication. Risk Communication is an interactive process that involves exchanging information and opinions about risk, both Risk assessment and risk management. Risk Management is an effort to manage occupational health and safety risks with its implementation component including hazard identification, risk assessment and risk control. Risk assessment is an attempt to calculate the magnitude of a risk and place whether the risk is recognized or not. Before conducting a risk assessment, first identify the hazard. One of the hazard identification techniques is Job Safety Analysis (JSA)[4].

One way to prevent accidents in the workplace is to establish and arrange work procedures and train all workers to implement efficient and safe work methods. Compiling work procedures that are correct and safe is one of the advantages of applying Job Safety Analysis. Job Safety Analysis is one method for identifying hazards which in its implementation emphasizes the identification of risks from hazards that arise at each stage of the work or task. This is in line with the approach to the cause of work accidents that starts from the condition or action that is not safe when carrying out an activity. Therefore, by identifying hazards for each type of work, appropriate and effective preventive measures can be taken. Positive things that can be obtained from the implementation of JSA[5], are:

1. As an effort to prevent accidents
2. As a safety contact tool for new workers
3. Review the job procedures after an accident
4. Provide pre job instruction on a new job
5. Providing personal training to employees

The Law of the Republic of Indonesia Number 1 of 1970 is the legal basis for Occupational Safety in Indonesia. This law discusses labor rights and obligations, as well as work safety requirements that must be applied in each company. Another related law is Law No. 13 of 2003 concerning Labor, article 86 in this Law states that every organization must implement occupational safety and health efforts to protect the safety of workers, while article 87 in this Law states that each company is required to have a Occupational Health and Safety Management System that is integrated with the management of other companies. To comply with the law in Indonesia and to minimize workplace accidents in the company, efforts are needed to identify potential hazards in the company. Identification of potential hazards and control can also use the Job Safety Analysis method[6].

The purpose of this study is to identify hazards, conduct risk assessments and study risk control on welding work at PT. Dok ddan Perkapalan Surabaya with Job Safety Analysis method, so that later it will be communicated to workers.

Material and Method

This type of research is a descriptive study with an observational approach. This research was conducted by interview and direct observation. This research was conducted at PT Dock and Shipping Surabaya, Surabaya, East Java. The type of welding process that

will be identified is SMAW. SMAW (Shield Metal Arch Welding) is an arc welding electric flame protected by using an electric arc as a heat source for melting metal[7]. The risk assessment method uses the JSA with the following risk assessment steps:

1. Select the place to be analyzed
2. Explain the stages of work
3. Identify the various hazards and risks that occur at each step of the work, and identify the various possibilities that have the potential to become accidents;
4. Risk assessment (likelihood and severity)
5. Categorize risk (risk assessment matrix)
6. Provide control recommendations

In its implementation, risk assessment looks at the workplace to identify equipment, situations, and processes, which can cause damage especially to humans. After identification is made, the risk of the possibility and severity of the risk must be evaluated, then determining the effective steps to prevent or control the loss[8]

Table 1 Scale of Severity

Level	Descriptor	Description
1	Insignifant	There was no injury, low financial loss
2	Minor	Minor injuries, moderate financial losses
3	Moderate	Moderate injuries, need medical treatment, High financial losses
4	Major	More than one serious injury, large loss, production disruption
5	Catastrophic	Fatal is more than one person, a huge loss of extensive impact that has a long impact, stops all activities

Source:[5]

Table 2 Scale of Probability

Value	Descriptor
1	Never happened or ever happened once a year
2	Usually it doesn't happen but the possibility of it happening still exists (every month)
3	There may be a small danger or a coincidence (once or once a week)
4	Possibility of occurring in certain circumstances (more than once per week)
5	Very likely to happen (every day)

Source: [9]

Table 3. Risk Assessment Matrix

Probability	Severity				
	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	6	10
1	1	2	3	4	5

Source: [5]

Risk Assessment shows the level of risk acceptable or unacceptable. Low risk categories range from grades 1-4, moderate risk 5-14, while 15-25 are high risk categories. Risk assessment matrix is used as the basis for carrying out further actions, so that the level of risk received can be reduced to a level that can be tolerated. Determining risk control measures is an effort to reduce or eliminate hazardous exposure in the work environment. Activities in the control are: elimination, substitution, technical engineering, administration, and finally personal protective equipment [10].

Findings

A. Risk Assessment

In the welding process Using the type of welding SMAW (Shield Metal Arch Welding) there are 3 stages with 7 job descriptions. The first stage begins with preparation, where there are steps to assemble a welding

device, adjust the amount of electric current as needed, and install the filler on the holder. At the preparation stage the potential hazards are electrical hazards such as electric shock, burning wires, and short circuit. There are 2 risk levels for the High Risk category and 3 Medium Risk categories.

The Second Stage is Implementation. At this stage is the welding process or the stage of the workpiece merge. The dominant danger present at this stage is the physical chemical hazard of toxins such as metal fume fever. Fume is a solid particle that is toxic, collects, and forms bonds with larger molecules. Fume particle size ranges from 0.001-0.1 microns which can endanger health problems[11]. Other hazards at this stage are cataract eye irritation, visible light and sparks from UV-B radiation and infrared. All risks at this stage fall into the High category.

The third stage is Finishing. At this stage is the activity of cleaning workpieces after welding, using both grinding machines and hammers. At this stage there is the risk of noise, burns, injury to the eyes due to grinding of work materials and sparks of welding material. At this stage all risks fall into the medium category.

B. **Risk Management**

From the results of the risk assessment, the percentage of risk categories is high risk 43% and medium risk 57%, and there is no low risk category, meaning that the welding work at PT Dok and Perkapalan Surabaya is included in the work that requires control measures to prevent accidents from occurring.

PT Dok dan Perkapalan Surabaya implemented one of the global occupational health and safety management systems that is in effect OHSAS 18001.2007. In the OHSAS 18001.2007 concept, risk management is a core element mentioned in clause 4.3.1[10].

Based on the results of Hazard identification and Risk Assessment in the welding section, there are several forms of control applied by PT Dok dan Perkapalan Surabaya, such as using a respiratory protective device type cartridge respirator to prevent the risk of inhalation of fume particles through inhalation and using a face shield to prevent risk of eye irritation and eye fatigue for exposure to UV-B radiation and infrared at the high-risk stage of the welding process.

Other controls applied by PT Dok dan Perkapalan Surabaya in the welding process are based on the control hierarchy, including engineering control. This is to create a footing board for road access when the work area is wet, installing a safety line in a hazardous work area flammable work equipment, tidy up scattered cables so as not to interfere with road access. Control which includes administrative control on welding is a warning sign installed in the work area, carried out safety talk before doing work, communication with fellow workers, coordination with the Health Safety and Environmental Officer, work permit for welding in hazardous places, standard operating standards (SOP) on each job, selection of employees to do certain jobs, conducting patrol safety and field inspection training on certain jobs, maintenance of work equipment, calibrating work tools.

Control by using personal protective equipment. The forms of personal protective equipment provided by the company are: safety helmet, safety belt, safety shoes, gloves, safety harness, ear plug / ear muff, mask and respiro mask, safety spectacles, goggles, face shields.

However, all of these control methods do not necessarily reduce danger and risk at zero, meaning that workers are still more likely to be exposed to hazards at work. Research conducted by Wahyu, P.D and Tualeka, A.R., 2013 in one of the welding industries in East Java, Indonesia explained that there is still residual risk despite risk control. So that residual risk assessment needs to be done so that it can further determine additional risk control recommendations[12]. For this reason, we need a strong commitment from human resources or management and the awareness of the workers on the use of personal protective equipment in every work.

C. **Risk Communication**

The results of risk assessment and risk management in the form of Job Safety Analysis Sheet must be communicated so that it can be known by all parties including workers. Communication must be easily understood by all parties so that it needs to be designed in accordance with the desired goals[5].

Risk Communication carried out at PT Dok dan Perkapalan Surabaya is through occupational health and safety development aimed at socializing and raising awareness of all workers about safety culture in the work environment for example: conducting safety induction is intended for new workers and transfer workers to enter

the welding activity area talk is held every Monday and Friday at the time before the start of an activity that contains informs of potential hazards at work. Safety campaign is an activity to install banners, posters that contain appeals for work safety, it is hoped that with these posters the workers are interested in reading and implementing their work, and conducting meetings of the Occupational Health and Safety Management Committee at the end of each month to discuss issues that occur improvement. Through the findings of patrol safety and inspection.

Conclusion

From the results of the risk assessment of the 3 stages with 7 job descriptions, the percentage of risk categories was obtained, namely high risk 43% and medium risk 57%, and there was no low risk category, meaning that welding work at PT Dok dan Perkapalan Surabaya included work requiring control to prevent accidents. Control carried out as part of risk management is going well but residual risk still exists so that it needs a strong commitment from human resources or management and the awareness of the workers on the use of personal protective equipment in every work. Risk communication is carried out through coaching or training, conducting safety induction, safety talk, Safety campaigns such as the activity of banner installation, posters, conducting meetings of the Worker Health and Safety Advisory Committee at the end of each month to discuss the problems that occur and make improvements.

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