

Preventing Accidents Through the Implementation of The Work Standards in the Welding Workplace

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Abstract—Work accident is one thing that must be prevented in the workplace. The risk of work accidents is very high in the welding workplace. This is because the workers use various sources of danger in the form of electricity gas and grinding. They also have the danger of the work environments in the form of heat, light, rays from welding processes, as well as noise and vibration. Workers in general are only armed with science potluck, and since it does not fit the standard, it eventually results in the fatal crash.

This research aims to analyze the analytical survey of the application of the standard work of the most risky against a work accident in welding workshop. Cross sectional approach has been done on 45 workers in the welding workplace with a total sample of sampling techniques. Free variable consists of preparation of working tools, welding, uplift, and age with a work accident as the variable. The research instruments were questionnaires and checklist. The chi square test was used as the data analysis technique with borderline significance $\alpha = 0.05$. To see the most risk factors, the researchers conducted multivariate Logistic Regression test.

There are several results in this research: 1) there is a connection standard implementation of work tools with the preparation work accident, 2) there is a connection standard implementation on how to weld with a work accident, 3) there is a connection standard implementation on how to lift with a work accident, and 4) there is the relationship of age with the occurrence of accidents. The most at risk for the occurrence of accidents is in the preparation work done with the equipment. This means that if the standards of work preparation tools do not apply properly, the risk of accidents is higher.

It is recommended to prepare all the tools work well and can actually be used and are also advised to maintain equipment properly and work according to the standard of work.

Keyword: PREPARATION FOR WORK, WELDING, LIFTING, AGE AND ACCIDENTS

1. INTRODUCTION

The number of work accidents in Indonesia reached 129,911 cases¹. In the city of Jambi, work accident cases reached 616 stemmed from the formal and informal industries². Forge Welding is one of the informal industries that used various sources of danger in the form of electricity gas and grinding³. They also have the danger of the work environments in the form of heat, light, rays from welding processes, as well as noise and vibration caused by the process of work.

The cause of work accidents in industries are generally categorized into two, namely the unsafe act (behavior unsafe) and the unsafe condition (unsafe conditions), but the most dominant factor in causing accidents are unsafe act. Based on the research of DuPont, work accidents are caused by 96% of unsafe act and 4% due to unsafe condition. The research results over the last 10 years showed that the unsafe act was the cause in almost every work accidents.⁴

Every work must be done according to the work standard. If the work does not fit the standards, it will cause an accident that gets bigger. Similarly, a work environment that does

not qualify the work process and the increasingly complex and modern work can be a threat of disease due to work and it can lead to work accidents⁵. Work accidents will result in some losses such as breakage, the chaos of organization, complaint and grief, and abnormalities and defects including death⁶. Triwibowo also states each job definitely has the risk of accidents caused by human factors, environmental factors and job factors⁶. According to Manuaba⁷ a comfortable working environment is urgently needed by workers to be working optimally and productive. Sumakmur also⁸ states the causes of work accident are mechanical and environmental factors as well as the human factors. The human factors cause accidents because the ability, capacity and human limitations are determined by a variety of factors including age, gender, race, health status, Anthropometry, physical freshness, nutrition, education, skills, culture, behavior, habits, and adaptability⁸. Because of the human factors, the mechanical work environment is arranged and designed in such a way so it will be conducive for the workers to carry out activities safely and comfortably. To work safely and comfortably to the risk of accidents can be minimized including self protective measures for workers.

It has been a lot of efforts made to reduce or prevent the occurrence of injuries due to accidents of behavioral approach to achieve the best results to reduce injuries in the workplace that is amounted to 59.6% followed by the approach of ergonomics 51.6%, then approach to engineering control of 29%⁹. For welding processes, there are already special standards which set the welding conditions in the workplace, including qualification of welding tools in the regulation of the Minister of labour¹⁰. but unfortunately the rules are seldom met by workers. Therefore, frequent accidents are mild or severe. Besides, old age have a higher tendency to experience occupational accidents compared with the age of the young because the young age have reactions and elusiveness⁶.

Researchs on the welding accident in the workplace are already done, but there are still few researchs on accident prevention through the application of the work standards. Thus, this research aims to examine the link between the application of the work standards including preparing equipments before work, applying the right ways of working in the weld, and making sure the proper application of the work standards when lifting and transporting the welding production. Doing preparation before the welding process starts have never be done, but the researchers see a work preparation is crucial and important to avoid the risk of accident. Therefore, this research aims to find out the relationship of the standard implementation in the working equipment preparations with work accidents, to examine the relationship of standard implementation of weld with work accidents, to identify the relationship of application standard transport and lifting work by accident and the relationship of age with work accidents, and to find out the most risky factor against the occurrence of work accidents in the workplace in Jelutung Subdistrict Jambi City.

2. MATERIALS AND METHOD

This research is a survey research with crosecctional design to analyze the application of the work standards that are most at risk against work accidents in welding workshop in Jelutung Subdistrict Jambi City, with the total samples are 45 samples of workers originating from the existing seven workplaces in the form of checklist instruments with Jelutung as the free variable and the questionnaire as the bound variable.

To test the hypothesis, the researchers used Chi Square test for the data analysis and

logistic Regression with continuation to look the most dominant factor against the occurrence of accidents.

3. RESULTS AND DISCUSSION

The results of the research and the discussion

The Application of the Standard Employment

Relationship on the Preparation of Working Tools and Work Accidents in Welding Workplace in Jelutung Subdistrict, Jambi City, 2017.

The research results of the data collection on the relationship of the work standard application on the preparation of working tools and work accidents on welding workers in the workplace as follows:

Table 1. The Application of the Standard Employment Relationship on the Preparation of the Tools and Work Accidents in Welding Workplace in Jelutung Sub-district, Jambi in 2017

No	Preparatio Work Tools	N		work accident		P
		wretched	not wretched	wretched	not wretched	
1	Not Good	36	30	6		0,002
2	Good	9	3	6		
		45	33	12		

Based on the results, it shows that the standard implementation of the welding tool preparation is not good as much as 80% turned out to be almost entirely accident (84%). Preparation of standard equipment means when the weld is not good then it can cause an accident. Chi Square test results can be $p = 0.002$ smaller than of $\alpha = 0.05$. It can be said that there is a connection between standard implementation preparation equipment with the occurrence of accidents. The equipments used in the workplace are not prepared according to the work standards, such as the lack of checking tools that being used, and the lack of checking whether the bolts already toned or not. So workers have to route the slender stones that should be used against the equipment, so that the instruments are ready for use, and the accidents can be avoided. The other thing that is rarely done well and perfectly is the installation of the equipments, so that the cable are scattered throughout the workplace. It is also often the cause of accidents. The cable is not organized neatly and it does not be kept well. So many of wires are already worn out, sometimes out of the cables. Other condition that causes work accidents is that insulation power cable opened on the butt welding rods are not repaired first before work. It is the usual state for them. In this condition, a risk of a fire accident can be high. In the preparation of this work standard equipment, the preparation is bad and it causes work accidents very high even up to 84%. This proves the opinion of Ridley¹¹, one typical cause of accidents is the work situation that includes insufficiency of the equipments. The insufficient or failed equipment means the preparation of the equipment does not meet the criteria, so the risk of an accident is in accordance with the results of this study. The equipments that are not maintained properly contribute to the accidents¹². The equipments used at the welding worktime should be prepared in such a way until ready to be used and it does not cause an accident. Ridley¹¹ also states the work equipments used should be checked

carefully by the competent person to ensure that the tools have been installed correctly, that it is safe to be operated, that any defects have been corrected, that their effectiveness has been tested, and that the new damage has been fixed.

b. Relationship of Welding Standard Application and Work Accidents in Welding Workplace takes Place in Jelutung Sub-district, Jambi City, 2017

The research results on the standard implementation of weld and work accidents for welding workers in the workplace are obtained as follows:

Table 2. The Relationship of the Standard Implimentaion of Weld and Work Accidents in Welding Workplace takes Place in Jelutung Sub-district, Jambi City, 2017

No	The Standard implementation of weld	N	work accident		
			wretched	not wretched	P
1	Not Good	35	29	6	0,007
2	Good	10	4	6	
		45	33	12	

From the data above, it can be seen that the standard implementation of weld are not good as much as 78% turned out to be almost entirely accident (83%). It means that when applying standard weld is not good enough, thus it causes an accident. Chi Square test results can be $p = 0.007$ smaller than of $\alpha = 0.05$. It can be said that there is a connection between the standard implementaion of weld with the occurrence of accidents.

The ILO¹² says that the use of inappropriate tools, equipment damaged tool as well as the wrong procedures are the sources of danger that have high risks for the occurrence of work accidents. However, many workers who work on welding process disregard the work standard requirements. A worker forces to use grinding is not good so late woes that make workers extremely fatal i.e. knife grinding catapulted ketenggorakan resulted in injuries to the workers so that sound kepala silent until now. Therefore, the tools that are used must be checked before. If it is in good condition, it can be used so that the risk of accidents can be minimized. The ILO¹² also states careless actions that do not follow procedures are very dangerous since it can cause fatal accidents. Workers who work only in accordance with his/her preferences want their work done quickly without taking into account the dangers that threaten it. The most important for them is only to work in accordance with their will in which it is not appropriate for the SOP. In general, the welding workers are the only mercenary workers, so that they have to achieve the target. Besides, welding job usually heaped with date line is shorter. Working in the welding workplace is similar to work with High Risk work because it has a source of electrical hazards and sharp objects that accompanied during the work time. Besides, the equipments used are not maintained properly so it looks some machine guards already quite apart, and this condition will also increase the occurrence of accidents. The result of this research is in line with the research done by Pratama¹³ that there is a relationship between the behaviour of workers with work accidents. part production PT. Linggarjati Mahardika Noble Pacitan. Using Chi square test, the researchers obtained p value 0.012 ($p = 0.012 < 0.05$). The research of Choirul¹⁴ also states the factors that affect the occurrence of accidents are behavioral workforce and work environment.

c. The Relationship of the Implementation of Standard Lifting and Transporting with Work Accidents in Welding Workplace takes Place in Jelutung Sub-district, Jambi City, 2017

The results of the data collection in this research on the relationship of standard lifting and transporting implementation with work accidents in welding workplace are shown in the following data:

Table 3. The Relationship of the Implementation of Standard Lifting and Transporting with Work Accidents in Welding Workplace takes Place in Jelutung Sub-district, Jambi City, 2017

No	The application of Standard Lifting transports	N	Work Accident		
			wretched	not wretched	P
1	Not Good	34	28	6	0,016
2	Good	11	5	6	
		45	33	12	

The result of the research on the implementation of standard lifting and transporting is less good, as much as 76% turned out to be almost entirely accident (83%). It means then when lifting and transporting, the worker's behaviors are not good or appropriate with the standards and it causes accidents. The result of Chi Square test is $p = 0,016$ smaller than $\alpha = 0.05$. It can be said that there is a connection between the standard implementation of lifting and transporting with the occurrence of work accidents. Lifting and hauling in the workforce are known with manual handling. Lifting weights in the welding workplace oftenturns the work accidents from mild to severe harm. This looks caused by workers lifting less taking into account circumstances surrounding such goods that yangsedang done left piled together, so that at the time of the lifting of the goods to be transported, tend to be about stuff other, so goods will transported forcibly pull so often about workers. Other things such as load is removed by large dimensions, length and weight and spiky and sharp surfaces. Preferably before being appointed, the spiky and sharp parts should be coated first with ade strong that the risk of accidents can be avoided. So, it is necessary to have a plan for lifting and transporting process, to observe the dimensions raised, to consider the amount of power that can be raised and how the right lift. Ridley¹¹ states the regulations need to be done to reduce the victims of the shocking injuries caused by manual handling. Martial Sovira's research result¹⁵ also shows that there is a significant relationship between unsafe behaviors such as excessive lifting weights in a position of bent, working with rush and others.

d. The Relationship of Age and Work Accidents in Welding Workplace in Jelutung Sub-district, Jambi City, 2017

The results of the data collection of research about the relationship of age with work accident on Worker Las workshop as follows:

Table 4. The Relationship of Age and Work Accidents in Welding Workplace in Jelutung Sub-district, Jambi City, 2017

No	Age	N	Work Accident		
			wretched	not wretched	P
1	Young	30	25	5	0,032
2	Old	15	8	7	
		45	12	33	

young age as much as 67% turned out to be almost entirely accident (84%). This result means when young age appropriate then it will experience a crash compared with old age. Chi Square test result is $p = 0,0032$ smaller than of $\alpha = 0.05$. It can be said that there is a connection with the age and the work accidents. Not all jobs can be done by all ages, sometimes a job suited to young ages, but sometimes suitable for old ages. Similarly, this research shows that the workers with young ages young age as much as 67% turned out to be almost entirely accident (84%). This result means when young age appropriate then it will experience a crash compared with old age. Chi Square test result is $p = 0,0032$ smaller than of $\alpha = 0.05$. It can be said that there is a connection with the age and the work accidents. Not all jobs can be done by all ages, sometimes a job suited to young ages, but sometimes suitable for old ages. Similarly, this research shows that the workers with young ages turned out to be more rapid, aggressive, haste and hurry in working so they tend to do inappropriate actions that potentially reduce performance, even causing work accidents. It can occur because age can affect the unsafe action. It needs to be emphasized that age is included as characteristics belonging to a person who can affect the unsafe action, although there are still some factors that dominates the incidence unsafe action¹². A young age often have accidents when compared with older age. On the job that requires a lot of powers, usually young labors are selected because of their physical strength, but the young age usually still full of emotion, sloppy and poor in experience, so often it causes actions that may endanger the safety work¹⁶. Therefore, it is necessary to have interconnection between the role of watchdog, the role of the manager in work behaviour and with the ongoing individual targets.

1. The Most Risky Factors for the Occurrence of Work Accidents in Welding Workplace in Jelutung Sub-district, Jambi City, 2017

Logistic Regression analyses were used to look at the factors that are most at risk, because the data are ordinal-shaped research.

Test Results of the Most Risky Factors for the Occurrence of Work Accidents in Welding Workplace in Jelutung Sub-district, Jambi City, 2017

Variables in the Equation

a. Variable(s) entered on stipe 1: Standar persp usiagrj, jmlplasgrp, pangkatgrp, usia

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Step		B	S.E.	Wald	df	Sig	Exp(B)
1 ^a	standard implementation siapgrp	1.450	1.224.	1.404	1	.236	4.264
	Jmlplasgrp	2.057	.950	4.690	1	.030	7.828
	pangkatgrp	1.216	1.216	1.001	1	.317	3.374
	Age	1.242	.900	1.905	1	.168	3.464
	Constant	-7.575	2.196	11.896	1	.001	.001

The test result above shows that there is more variable from 0.25 i.e. application of standard lifting and transporting p value > 0.317 so as to continue the application of test standard lifting and transporting eliminated. Next followed by the results of the test as follows:

Variables in the Equation

a. Variable(s) entered on step 1: Standar persp siagr, jmlplasgrp, usia

To test the next visible age also has considerable value 0.203 then age removed so obtained test results as follows: Variables in the Equation

The multivariate logistic regression test result shows p value is smallest standard preparation equipment just 0.009. Thus, it means the most risky factors for the occurrence of accidents is the application of the standard preparation equipments.

The case caused by the work in the welding workplace is dense energy so that the readiness tools work very determine whether crash occurred as compared to the standard implementation of weld, the application of standard lifting and transporting as well as age. If the tools that want to be used have been prepared in accordance to the standards, the risk of an accident will be low. So, from the research result, it turns out that the standard implementation of preparation equipment is a very important factor to avoid work accidents.

CONCLUSION

1. There is a relationship between the standard implementation of preparation equipments and work accidents in welding workplace in Jelutung, Jambi.
2. There is a connection between the standard implementation of weld and work accidents in welding workplace in Jelutung, Jambi.
3. There is a connection between the standard implementation of lifting and transporting and the work accidents in welding workplace in Jelutung, Jambi.
4. There is a relationship between age and work accidents in welding workplace in Jelutung, Jambi.
5. The most risky factor on the occurrence of 1. the work accidents in welding workplace in Jelutung, Jambi is the preparation tool behaviors.

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1. It needs a proper standard of work,
2. An education about the importants of the work standards is needed for the workers

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