

THE IMMEDIATE CAUSE FACTORS WHICH CAUSE WORK INCIDENT IN WELDING AND CUTTING OFFICERS

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Abstract - Welding and cutting is often found in shipping industry especially for ship repair in Indonesia, PT. X one of them. The work involving O₂ and Acetylene gases is a combustible material at the time of ignition. The risk of significant accident hazards experienced by workers such as exposed to sparks, stung, electrocuted to cause unconscious self. The number of accidents occurred in PT.X in 2014 as many as 8 cases with serious injury category. Then in 2015 an increase in accidents with the incidence of 19 cases of accidents and resulting in severe injuries that 90% caused due unsafe action. One of the prevention of accidents in the workplace to avoid recurrence is to know the factors causing the occurrence of workplace accidents in the future is not repeated. The purpose of this study is to analyze the direct cause of incident occurrence in welding and cutting officers in the Division of Repair and Maintenance PT.X Surabaya using the ILCI Loss Causation Model method seen from the immediate cause, to the occurrence of the accident (incident). This research is an analytic research with cross sectional approach. Sample 44 welding workers. Selection of respondents was taken based on simple random sampling method. The data obtained were collected from questionnaires, interviews, measurements, and observations. Data analysis using Chi-square test with significant level $\alpha = 0,05$. The results showed that the incident experienced incident. There is a significant correlation between substandard practice such as adherence to use of PPE and work instruction with incident. In addition substandard conditions are also associated with incident events such as lighting and working climate. Suggested by adding, housekeeping inspection points, mandatory point using and poured in work instructions, hydration corner, and artificial lighting.

Keywords-Work Accidents, Personal Protective Equipment, Perception Lighting, Working Climate Perception, Work Instructions

I. INTRODUCTION

PT. X as one of the strategic industries that produce the main tool of Indonesian defense system especially for the sea dimension, its existence certainly has an important and strategic role in supporting the development of national marine industry (1). Shipbuilding and ship repair require heavy equipment and involve labor because during the process the raw materials used in the form of steel and iron. The type of work that plays an important role during the process is the welding and cutting of risky jobs because it is always associated with fire and flammable materials such as acetylene and oxygen.

The data of accidents in 2005-2006 shows the number of accidents caused by gram fragments that affect the face and hands ranked 1 of several divisions in PT. X. Indirectly can be illustrated that the risks that may be faced by workers at PT. X is getting higher considering the number of work accidents in 2012 to 2013 in 25 cases (1) Preliminary preliminary study mentions Consists of several major divisions that are for the assembly of new vessels and repair of old ships. One of them in the Division of Maintenance and Repair which is engaged in the repair ranging from the turn of the hull plate to machining.

All these activities related to the replacement of the old plate means that the risk aspect of improvement has a high level of hazard risk rather than associated with a new plate (new shipbuilding). This is in accordance with the research that has been done to know the risks and the level of risk in new buildings, especially industries engaged in the field of small-scale shipyards.(1) Basically the occurrence of work accidents caused by two groups. The first category is the mechanical and environmental factors (unsafe condition), while the second group is the human factor (unsafe action) (2).

II. METHOD

This research is analytical with quantitative approach and the research design used is cross sectional. Respondents in this research is welder / fitter who work a day at PT.X. Population in this research consist of fitter welder PT. X, Harkan Division of 44 respondents consist of permanent employees and contract.

Data collection was done by distributing questionnaires to 44 respondents selected to be a research sample. Independent variables consist of compliance with work instruction, compliance of PPE usage, perception of lighting, perception of work climate with dependent variable in the form of incident. The data is in though through the data processing program that is SPSS by using Fisher's exact test to see the relationship between independent and dependent variables

III. RESULT AND DISCUSSION

Tabel 1. Incident on Welder and Fitter

Variable	Frequency	Percentage (%)
Yes	39	88,6
No	5	11,4
Total	44	100

Based on the data in Table 1 it can be seen that most of the existing welding and cutting workers in this division have experienced incident incidence during work that is equal to 88.6%.

In general, the direct cause of an incident is due to unsafe behavior (unsafe act) and unsafe condition (3). The most frequent incidents experienced by workers are electrocuted. Argues that accidents are a series of processes of cause and effect not only on the basis of a single event. Basically fatal accidents arise due to the incidence of minor accidents left and not handled.(4)

Table 2. Relationship between Compliance Work Instructions with Incident

Compliance Work Instructions	Incident						Coefficient Association	p-value	Conclusion
	No		Yes		Total				
	N	%	N	%	N	%			
Not Obey	3	42,9	4	57,1	7	100	0,432	0,023	Significant
Obedience	2	5,4	35	94,6	37	100			
Total	5	11,4	39	88,6	44	100			

Based on Table 1. Statistical analysis results, there is a relationship between work instruction compliance with incident incidence in welding and cutting workers. Cross-tabulation analysis of descriptive mention that between compliance to run Work Instructions of respondents with work accidents that welder or fitter workers who have experienced incident events mostly on respondents who obedient in compliance with welding and cutting work instructions.

This research is in accordance with research on workers at PT. X states that there is a relationship between compliance with the procedure against the high incidence of occupational accidents.(5)

This study in accordance with the opinion that compliance is one form of behavior influenced by internal factors and external factors in accordance with applicable provisions.(6) Argues that adherence results in temporary behavioral changes and individuals tend to return to their original view / behavior if group controls relax or move from their group. (7)

This study is not in line with research conducted states that there is no relationship between compliance and workplace accidents.(8)

Tabel 3. Compliance PPE with ncident

Compliance PPE	Incident						Coefficient Association	p- value	Conclusion
	No		Yes		Total				
	N	%	N	%	N	%			
Not Obey	1	3,3	29	96,7	30	100	0,370	0,029	Signifika
Obedience	4	28,6	10	71,4	14	100			
Total	5	11,4	39	88,6	44	100			

Based on Table 3. The results of statistical analysis mention that there is a relationship between compliance with the use of PPE with incident incidence in welding and cutting workers. It is indeed in harmony with the results obtained that people who experience the incident are people who do not use PPE during welding or cutting. Observation of unsafe employee behavior such as the use of personal protective equipment is incorrect and is not in proper condition according to the type of danger, for example fitter welder using gloves in the glove condition is much peeled and potholes.

Someone argues that an effort is needed in improving occupational safety and health, one of which is by providing personal protective equipment for employees who work in an environment using dangerous equipment.(9) PPE can reduce the severity of an accident or PAK, but it can not protect the body as a whole against exposure to potential hazards (2)

IV. PERCEPTION LIGHTING

Tabel 4. Perception Lighting with Incident

Persepsi Pencapaian	Incident						Coefficient Association	p- value	Conclusion
	Tidak		Ya		Total				
	N	%	N	%	N	%			
Tidak Terganggu	4	28,6	10	71,4	14	100	0,370	0,029	Significant
Terganggu	1	3,3	29	96,7	30	100			
Total	5	11,4	39	88,6	44	100			

Based on Table 4. The results of statistical tests mention that there is a relationship between lighting with incident in welding and cutting workers. Lighting is an important aspect to keep in mind during the work

The results of lighting measurements at some point in the Division Harkan obtained average lighting in the production unit when welder or fitter is in the room ranging from 50 lux to 55 lux. The intensity of local lighting that is quite low is obtained from the illumination produced by the welding activity and artificial light comes from emergency lights with small wattage. Whereas when outdoors on average show the number 1505 lux because of illumination comes from the scorching sunlight Based on the measurement results according to Regulation of the Minister of Manpower no5 years 2018 for this kind of meticulous work, requires at least 300 lux lighting.

According to be able to realize an effective working environment within the company there are several factors that must be considered are light, color, air, and sound(10). However, if the lighting in the workplace including less can cause work-related illness is blurred vision (11). In addition, the impact that can arise is the emergence of eyestrain with reduced power concentration and efficiency of eye work, mental fatigue

V. PERCEPTION OF WORK CLIMATE

The result of statistical test stated that there is a relationship between work and incident on welding and cutting worker. Measurement of work climate in Division Harkan ISBB obtained in this production unit when welder or fitter while in the room is equal to 27.4 0C. While the measurement results when the worker is outdoors on average shows 30.60 C. If the measurement results are based on the Regulation of the Minister of Manpower no. 5 year 2018 on Occupational Health and Safety Working Environment stating that workers who have hourly working hours ranging from 50-75% and included in the heavy workload should not be exposed to temperature 27.50 10

High working environment temperatures can potentially lead to dehydration in workers, leading to fatigue and occupational accidents (12). This high Temperature quickly makes the concentration of workers decreases in addition to increased sweat production, the body becomes dehydrated due to the situation. In this study, it can be seen not only indoors outside the room temperature above the safe zone,

Tabel 5. Work Climate with Incident

Work Climate	Incident						Koef. Asosiasi	p-value	Kesimpulan
	No		Yes		Total				
	N	%	N	%	N	%			
Not Disturbed	3	37,5	5	62,5	8	100	0,388	0,035	Significant
Disturbed	2	5,6	34	94,4	36	100			
Total	5	11,4	39	88,6	44	100			

VI. CONCLUSION

Welding and cutting workers, which amounted to 44 people, mostly experienced an incident incidence of 88.6%. The type of workplace accidents that often occur is shocked. The direct causing factor of incident incidence consists of substandart action and substandart conditions. Substandart practice factors related to the incident are compliance of running work instructions (p value 0.023) and compliance with the use of PPE (p value 0.029). Substandart condition factors related to incident are perception of lighting (p value 0,029) and perception of work climate (p value 0,035). Suggested by adding, housekeeping inspection points, mandatory point using apd poured in work instructions, hydration corner, and artificial lighting.

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