Research and Innovation in Technical and Vocational Education and Training Vol. 2 No. 1 (2022) 081-089

RITVET

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/ritvet
e-ISSN : 2785-8138

Safety Knowledge of Welding Workers in The Manufacturing Industry

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DOI: https://doi.org/10.30880/ritvet.2022.02.01.011
Received 04 March 2022; Accepted 25 March 2022; Available online 30 March 2022

Abstract: Safety knowledge aspect is a very important aspect to prevent accidents. This problem arises due to workers lacking knowledge of safety knowledge. The purpose of this study is to identify the safety knowledge of welding workers in the manufacturing industry in Pasir Gudang, Johor. This study has six objectives, which is to identify aspects of safety knowledge in terms of regulation, environment, responsibilities, hand tools use, machines use and the relationship between aspect of safety knowledge towards the safety practice of welding workers in the manufacturing industry. Research design for this study is quantitative survey method. A total of 70 participants were selected as samples of the study comprising welding workers in five manufacturing industries in Pasir Gudang, Johor. This finding will be analyzed using Statistical Package for Social Science version 26.0 and the data analyzed using descriptive statistical methods to find the value of the mean score and the standard deviation. Based on the analysis, the results showed that the safety knowledge of welding workers in the manufacturing industry was at a moderate level where the safety knowledge aspect in terms of regulations (M = 2.88, SP = 0.116), environment (M = 2.98, SP = 0.153), responsibility (M = 2.89, SP = 0.150), use of hand tools (M = 2.89, SP = 0.174) and machine use (M = 2.87, SP = 0.230). Meanwhile, the analysis of the relationship between aspects safety knowledge of welding workers on the practice safety of welding workers in the manufacturing industry using the inferential analysis method (Pearson-r) to find the value of correlation. Based on the analysis, the Pearson-r correlation value showed that the relationship between safety knowledge aspects of the rules was 0.566, environment was 0.898, responsibility was 0.869, hand tool use was 0.531 and machine use was 0.741. Overall, based on the findings, it can be concluded that the employee safety knowledge on the safety practice of welding workers in the manufacturing industry is at the highest level.

Keywords: Safety Knowledge, Prevent Accidents, Welding Workers

1. Introduction

In the manufacturing industry, the number of accident cases is moving in tandem with the rapid growth of an industry. In 2015, a total of 62,837 accidents were reported. The following year, this figure

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continued to rise dramatically to 66,618 accident cases. Of the total accidents in 2016, 12,401 were attributed to the manufacturing sector (Selamat, 2020). Reports show worker safety is not taken seriously and accident figures are rising every year. Employers who neglect the welfare of their employees cause losses and induce accidents. Employers should spend money to cover the costs of treatment and rehabilitation of workers while workers lose their source of income. In addition, employers are also forced to shell out additional costs due to stalled productivity.

The aspect of occupational safety is a question due to the case of accidents that occur every year. This is due to the fact that employees are not aware of safety aspects that can cause injury to them. Neglect of safety aspects in employment has a detrimental effect on the development of an industrial organization. The decline in work performance and work productivity stems from the welfare of employees and the neglected worker environment (Azreen, 2020). In addition, the productivity level of workers in Malaysia is well positioned, but the country's productivity is declining year on year. According to the Malaysian Productivity Corporation (MPC), 2016, the country's labour productivity level has dropped to 46th from 45th in the world in 2005. The country's labor productivity level has dropped to 47th in 2015. This data proves that the possibility of lack of emphasis in some aspects such as regulations, environment, responsibility, use of hand tools, machine use and occupational health is not emphasized to the detriment of employee productivity and subsequently affects the development of the organization.

As is known, the manufacturing industry in the welding sector is heavily exposed to danger. The safety aspect should not be underestimated by all parties especially the employees. Welders are more exposed to the risk of workplace hazards. Among the risks of welders are burns, electric shocks, explosions, fumes and poison gases. Exposure to welding fumes is a growing public health concern around the world. Weld fumes are generated from electrodes and filler wires, and fluxes (Bakri, 2019). In addition, base metals, armored gases, and paints or layer surfaces are also contributing to the formation of fumes. These chemicals cause inflammation and cause the deterioration of the welder's lungs (Wanjari, 2020). Employee safety is an issue that should be emphasized by all parties especially employers who are the organizers in a workplace (Ismail, 2020). This is why the issue of employee safety should be given due attention and taken seriously to prevent uninvited matters from happening among employees. Employees should also practice caution before you have to and love yourself to keep them safe at work (Said, 2011). The number of accidents that occur can be reduced by the awareness in all parties about workplace safety.

1.1 Problem Statement

The manufacturing industry contributes greatly in the development of the economy to the country. At the same time, the manufacturing industry is labor-oriented. Large numbers of employees are exposed to the risk of accidents. Working in the welding sector is especially dangerous due to its environment. They are exposed to the risk of injury or accident to themselves or others. Therefore, workers in the welding sector need to be aware of the safety aspect when doing work. Safety regulations are guidelines that must be followed in order for the safety of employees and the quality of work. Workers in the welding sector are heavily exposed to danger. Therefore, they need to adhere to the rules set by the organization. Moreover, working in a conducive environment is very important as it guarantees safety, comfort and good ventilation. Employees should support and cooperate with employers. They should be responsible for all matters provided by the employer such as using personal protective equipment or clothing or any equipment supplied, reporting any damage to machines or hand tools and maintaining workplace hygiene. In addition, keep colleagues safe in order to ensure safety, improve work productivity and quality of work. Any safety measures or regulations that are well practiced will guarantee the safety of all. Competent workers have a good knowledge of handling hand tools and machines. If an employee does not have the skills to use hand tools or machines it will lead to an accident. In welding, workers need a variety of hand tools and machines to assist workers in completing weld work. Therefore, employees should have knowledge about the use of hand tools and machines to ensure safety when using them. Therefore, this study was conducted to study the safety knowledge of welding workers in the manufacturing industry based on the aspects of regulation, environment, responsibility, use of hand tools and machine use.

1.2 Research Objectives

i. Identify aspects of safety knowledge in terms of regulation for welding workers in the manufacturing industry.
ii. Identify aspects of safety knowledge in terms of environment for welding workers in the manufacturing industry.
iii. Identify aspects of safety knowledge in terms of responsibilities for welding workers in the manufacturing industry.
iv. Identify aspects of safety knowledge in terms of hand tools use for welding workers in the manufacturing industry.
v. Identify aspects of safety knowledge in terms of machine use for welding worker in the manufacturing industry.
vi. Study the relationship between aspect of safety knowledge towards the safety practice of welding workers in the manufacturing industry.

2. Methodology

The purpose of the study design is to get answers to the research questions. The results of a study are based on the methodology and design of the study. Descriptive quantitative and inferential analysis (*Pearson*) methods were chosen by the researchers to be used in this study

2.1 Population and Sample

A total of 85 populations were selected to be welders in the manufacturing industry. Researchers used Krejcie and Morgan's (1970) tables as sample selection. According to Krejcie and Morgan's table (1970), 70 samples were used to obtain study data. The study focused on five manufacturing industries in welding in Pasir Gudang, Johor.

2.2 Research Instrument

Questionnaires are used as instruments in this study to obtain information and data from selected respondents. The instruments used for this study are adaptations of knowledge studies and workshop safety practices among community college students while doing practical work in workshops. The pilots study have been conducted to 30 workers in manufacturing sector in area Batu Pahat. The questionnaire consists of six major parts, part A, B, C, D, E and F. These instruments have been validated by experts from education area and reliability index was developed based on Cronbach's Alpha (α), which is in this case appropriate for research work reliability coefficient of 0.70 or higher is considered acceptable in most social science research situations. The result indicated a high index of reliability at 0.937 ensuing that this questionnaire can be used for data collection.

3. Results and Discussion

The results of the data collected from the instrument of the questionnaire have found that it is a normal distribution based on the analysis report from the software SPSS version 26.0.

Table 1: Safety knowledge aspects in terms of regulations for welding workers in the manufacturing industry

Item	Mean (M)	Standard Deviation (SD)
1. Don't joke when working	2.94	0.168
2. Use covered and rubber shoes while working.	2.89	0.302
3. Avoid wearing personal jewelry made of metal such as clocks, gold chains, bracelets, rings etc.	2.87	0.320
4. Understand the materials worked as well as the tools or machines used.	2.84	0.367
5. Be responsible for the safety of colleagues and others around them.	2.93	0.26
6.Wear appropriate and neat clothes while doing welding work.	2.73	0.448

7.Wear personal protective equipment (masks, leather gloves, face shield, head shield) before working.	2.90	0.302
Overall average	2.88	0.116

Based on the finding of analysis in Table 1 show that safety knowledge in terms of regulations for welding workers in the manufacturing industry at a moderate level (M=2.88; SP=0.116). Specifically, item 1 (Don't joke when working) has shown the highest mean value and standard deviation of (M=2.94; SP=0.168). In item 6 (Wear appropriate and neat clothes while doing welding work) got the lowest mean value in the questionnaire Part B that is (M=2.73; SP=0.448).

Table 2: Safety knowledge aspects in terms of environment for welding workers in the manufacturing industry

Item	Mean (M)	Standard Deviation (SD)
1. A clean and organized workplace environment provides comfort at work.	2.97	0.168
2. Doors and windows should be opened when doing welding work.	2.90	0.347
3. The workplace environment should always be bright when making welding work.	2.89	0.320
4. Debris of work items should be placed in the right place.	2.80	0.403
5. Greank flooring needs to be cleaned.	2.84	0.404
6.Hand equipment is placed where it comes from after use.	2.84	0.367
7.Be aware of warning signs such as CAUTION!, SLIPPERY FLOORING, FAULT MACHINE can keep yourself and others safe.	2.94	0.234
8. Perform welding work at a designated place.	2.86	0.391
9. Workshop is a non-smoking area.	2.89	0.320
10. Access and exit should be open free of hours without any restrictions when the workplace is in use.	2.94	0.234
Overall average	2.89	0.153

Based on the finding of analysis in Table 2 show that safety knowledge in terms of environment for welding workers in the manufacturing industry at a moderate level (M=2.89; SP=0.153). Specifically, item 1 (A clean and organized workplace environment provides comfort at work) has shown the highest mean value and standard deviation of (M=2.94; SP=0.234). In item 4 (Debris of work items should be placed in the right place) got the lowest mean value in the questionnaire Part C that is (M=2.80; SP=0.403).

Table 3: Safety knowledge in terms of responsibility for welding workers in the manufacturing industry

Item	Mean	Standard Deviation
1. Any damaged machines and hand tools should be reported to management.	2.96	0.204
2. Reminding work colleagues about personal safety while doing practical work is necessary.	2.86	0.391
3. Store in the original place after using the equipment	2.81	0.392
4. The workplace should be cleaned after the work carried out.	2.91	0.282
5. Any accidents that occur should be reported to management.	2.90	0.302
6. Disturbing a work colleague who is operating a machine is life-threatening.	2.86	0.352
7. Initial emergency treatment must be done in case of an accident (wounds, shortness of breath).	2.89	0.320
8. Ensure flammable materials far from the source of fire.	2.96	0.204

Overall average	2.89	0.150

Based on Table 3, the findings for the analysis in Part D show that the overall average value of safety knowledge in terms of responsibility for welding workers in the manufacturing industry is at a moderate level (M=2.89; SP=0.150). Item 1 (Any damaged machines and hand tools should be reported to management) and item 8 (Ensuring flammable materials far from the source of fire) indicate the highest mean compared to other items in Part D (M=2.96; SP=0.204). While for item 3 (Store in the original place after using the equipment) recorded the lowest mean interpretation score in the happiness of this analysis (M=2.81; SP=0.392).

Table 4: Safety knowledge in terms of hand tools use for welding workers in the manufacturing industry

Item	Mean	Standard Deviation
1. Using a blunt hand tool can lead to accidents.	2.94	0.234
2. Appropriate use of hand tools to work can prevent accidents.	2.89	0.320
3. A loose iron hammer needs to be repaired before use.	2.87	0.367
4. Don't pointing a sharp tool to others.	2.87	0.337
Overall average	2.89	0.174

Based on the data analysis findings in Table 4 show that the average value safety knowledge in terms of hand tools use for welding workers in the manufacturing industry is at a moderate level (M=2.89; SP=0.174). Specifically, item 1 (Using blunt hand tools can lead to accidents) has shown the highest mean and standard deviation (M=2.94; SP=0.234). On item 3 (A loose iron hammer needs to be repaired before use) and item 4 (Don't pointing a sharp device to others) gets the lowest mean interpretation score in this section of analysis (M=2.87 and the standard deviation 0.367 and 0.337)

Table 5: Safety knowledge in terms of machine use for welding workers in the manufacturing industry

Item	Mean	Standard Deviation
1. Check the machine and make sure the machine is in good condition before start working.	2.86	0.352
2. Avoid using machines that have leaks on the insulating parts of the wires when carrying out work.	2.90	0.302
3. Using a machines (grinder machines) that have blunt tool points can lead to accidents.	2.90	0.302
4. Use oil or cooling liquid during work to prevent metal tools from damaged.	2.80	0.403
5. When using a cutter machine, concentrate and make sure the hands are not very close to the spinning saw's eye.	2.87	0.337
Overall average	2.87	0.230

Based on the data analysis findings in Table 5 show that safety knowledge in terms of machine use for welding workers in the manufacturing industry is at a moderate level (M=2.87; SP=0.230). Specifically, item 2 (Avoid using machines that have leaks in the insulating parts of the wire while carrying out work) and item 3 (Using a machines (grinder machines) that have blunt tool points can lead to accidents) have indicated the highest mean value and standard deviation (M=2.90; SP=0.302). On item 4 (Use oil or coolant liquid during work to prevent metal tool from damaged) got the lowest mean value in section F (M=2.80; SP=0.403).

Table 6: Correlation Analysis

No.	Relationship Between Safety Knowledge	Correlation Pearson	Significant	Relationship Level
1	Rules	0.566	0.000	Moderate
2	Environment	0.898	0.000	High
3	Responsibility	0.869	0.000	High
4	Hand tools use	0.531	0.000	Moderate
5	Machine use	0.741	0.000	High

Table 6 above shows the correlation between the safety knowledge aspects of the safety practice for welding workers in the manufacturing industry. From the table analysis the value of the correlation coefficient for the aspect of safety knowledge with the regulations is 0.566. It can be concluded that there is a moderate relationship. This relationship is positive and significant because of the confidence level is 0.00 less than the confidence level set at 0.01. Next, the value of the correlation coefficient for the aspect of safety knowledge with the environment is 0.898. This shows that there is a high relationship. This relationship is positive and significant because of the confidence level is 0.00 less than the confidence level set at 0.01. From the analysis correlation table, the value of the correlation coefficient for the aspect of knowledge with responsibility is 0.869. It can be concluded that there is a high correlation. This relationship is positive and significant because of the confidence level value is 0.00 less than the confidence level set 0.01. Furthermore, the correlation coefficient value for the aspect of safety knowledge with the hand tools use is 0.531. This shows that there is a moderate relationship. This relationship is positive and significant because the confidence level is 0.00 less than the confidence level set at 0.01. Finally, the value of the correlation coefficient for the aspect of safety knowledge with the machines use is 0.741. It can conclude that there is a high correlation. This relationship is positive and significant because the confidence level is 0.00 less than the confidence level set at 0.01. Therefore, the hypothesis is accepted, it indicates there is the relationship between the safety knowledge aspects towards the safety practice of welding workers in the manufacturing industry.

3.1 Discussion

The mean findings on item 4 of the study are in line with the findings of researchers in which welding workers know about the importance of understanding the materials employed, the use of tools and machines. Researchers have found that welding workers in the manufacturing industry should not neglect the safety aspects related to regulations while at work. Hence, welders should be mindful of safety aspects related to this regulation in order to avoid accidents while doing work. This awareness has a positive impact on employee safety, employee performance and even enhanced productivity of an organization. According to Kumar & Bansal, (2013) employers should be concerned about the safety of workers by emphasizing on safety acts and regulations issued by DOSH and other government agencies to reduce the rate of accidents occurring in the workplace. Safety management is important in an organization in ensuring that employees are at optimum levels, increasing employee productivity levels and reducing irrelevant costs such as insurance costs, claims and compensation (Fardaniah, 2018). The mean findings on item 7 of this study are in line with the findings of researchers in which welding workers know about the wearing of personal protective equipment before doing any work. This is because welders can work in a safe work environment and can guarantee the safety of their employees. Based on the mean value of item 2, the respondent knew about safety regulations by using covered and rubber shoes while working. A good employee attitude is that employees who are able to comply with established safety regulations and can reduce workplace accidents (Arifin, 2019). Welders who always adhere to safety regulations are the attitude that every welder should have in order for them to do the weld work safely. Welders working in the manufacturing industry are exposed to various risks such as body health, workplace accidents, emotional problems, job absences and problems involving psychosocial (Nasir, 2019). Such a risk will occur when the employee carries out welding work. Having a good workplace environment helps improve the quality of work and productivity of employees. Next, the findings from the mean score of the study item 8 (Doing welding work in a designated place) can reduce the risk of ergonomics to the employee. An ergonomic workplace environment can help improve

employee quality and productivity (Safe, 2020). Welders often work in cramped environments where a narrow environment presents an ergonomic risk such as muscle fatigue, bodily injury or skeletal muscle disease (muscular skeletal disorder– MSD) and carpal tunnel syndrome (wrist). This shows that it is important for welding workers to be knowledgeable and always perform ergonomic practices when carrying out work.

The findings from Juhari, (2020), accidents occurred due to the carelessness of employees in the safety of themselves and friends. Mean score findings on item 6 (Disturbing a work colleague who is operating a life-threatening machine). Welders are at risk of being exposed to danger while performing welding work. Distractions joke when doing life-risking work. Therefore, employees should practice safety practices while they are working. Friends are a shared responsibility in maintaining safety at work and reducing accidents. The act of joking while doing welding work is a violation of safety regulations which can cause an accident to occur. Researchers argue that welders have a high awareness of safety knowledge in terms of responsibility. In addition, according to Che Kob, (2018), accidents occurred due to workers who not being given adequate safety training by employers and safety equipment that did not fit the work needs was merely sufficient. The findings of the study mean score item 1 (Any damaged machines and hand tools should reported to management) also at a high level. The findings are in line with the findings of the study whereby welders know the procedure in the event of an accident at work. If this is the case otherwise it may be due to management not monitoring employees when doing welding work. The results of this study hope to help in providing feedback to certain parties to monitor and address the problems that arise in the future.

According to Fazreen, (2013), employees who practice safety practices while handling hand equipment well will provide smooth work measures without risking themselves. With this awareness, employees can avoid unwanted accidents. The mean findings on item 1 of the study are in line with the findings of researchers in which welders are aware that the use of blunt hand tools can lead to accidents. This is because, if the welder does not practice safety when using hand tools it will increase the risk of accidents. Next, according to Wanjari (2020), there are several factors that drive the number of accidents to occur in the workplace are due to the environment, negligence of employees, the use of equipment and machinery. However, the main factor causing the injury is the use of equipment. The mean findings on item 3 are in line with the findings of the study whereby the welder is aware that the hammers that are loose handles need to be repaired before use. This is because, before using any welder's hand tools are sensitive to the condition of the hand tools that they will use in good condition or not.

The findings from Lundeen, (2019) the skill of machine use in welding work are an added value to the level of work productivity. This is because the use of machines can help welders in doing welding work. The mean findings on item 1 of this study are in line with the findings of researchers in which welders know that checking the machines and keeping the machines in good condition before starting work. This is because welders are really knowledgeable about safety in operating machines. Next, according to Mohamad, (2019) workers need to have the skills and knowledge in using machines and new technologies, especially technology imported from abroad. Researchers argue that welders have a high awareness of machine use. Based on the mean value in item 3 which is the use of machines (grinder machines) that have blunt tool points can lead to accidents. This is because of the good exposure from management to welders about safety in machine use.

In the manufacturing sector, empowering works are usually done by workers from the welding field such as doing work in enclosed places with limited ventilation of wind space. According to Muizuddin's (2018), the environment is a very important role as the environment will affect the quality of work production. Researchers found that a favorable environment would affect the safety level of welding workers working in conducive conditions. They can also avoid receiving accidents during work that can affect employee productivity. Through the findings, the welder did not like to wear a predetermined style of wear. This is because they feel it is insignificant in doing welding work. According to Nasir, (2018), accidents that occur due to the failure of employees to obey the safety regulations set by management. This is because working in high-risk places, we cannot anticipate what will happen next as an example of the possibility of an accident. Through the findings of this study, welding workers do not practice storing equipment after use as it is only a waste of time to store the equipment back.

Researchers feel this needs to be taken seriously as employees need to be responsible for take care of the equipment provided by the employer. According to Juhari (2020), accidents occurred due to the attitude of irresponsible attitude employees in using equipment provided by employers. Equipment that should be stored, located on average, will result in irregular workplaces and will make it difficult for other employees to use them. Researchers found that welders lack safety in terms of the use of hand tools because when using equipment, workers do not follow safe work procedures. Safety aspect is the most important factor emphasized in doing work so that the risk of accidents can be reduced (Zainudin, 2010). Safety awareness should be instilled in every employee so that this safety-conscious attitude can be practiced. Finally, the findings of the study found that an employee practices safety practices when operating machines, it will help employees to work smoothly and safely. This statement is supported by Khairi (2017), employees with a good knowledge or skills in handling equipment and machines contribute to the increase in work productivity as the man power is a key pillar of an organization's success.

4. Conclusion

This research has studied the level of safety knowledge of welding workers in the manufacturing industry. The results from the study showed that welding workers should be exposed to the aspects of safety knowledge which in this way can increase the level of awareness of employee safety knowledge. The contribution of the results of the study to the safety knowledge of the welding field workers is the result of the reference of previous scientific materials. Implications to the Industries under the Manufacturing Sector regarding the safety risk aspects of workers can be used to the best of their ability to help increase the level of knowledge of employee safety among workers. The role of employers in employee safety knowledge is considered to be very important and should be taken seriously in order to produce employees who are free from the risks of employee safety. Furthermore, the welding industry should be responsible for providing workers related to welding operations.

Acknowledgement

The author would like to express appreciation to the Faculty of Technical and Vocational Education, Universiti Tun Hussein Onn Malaysia.

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