Research Article

Job Hazards Analysis in the Maintenance and Repair of Radio and Television in Minna Metropolis

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Abstract

The purpose of the study is to carry out job hazard analysis in the maintenance and repair of radio and television in Minna metropolis. Two research questions guided the study. The design used for this study is the cross-sectional survey research design. The study was carried in Minna metropolis of Niger State, Nigeria. The population of the study is made of radio/television technicians and electronics lecturers. A total of eighty five (85) respondents were used for the study, out of which, 65 are Radio/Television Technicians in Minna metropolis and 20 are lecturers of electronics from Federal University of Technology, Minna, Niger state, Nigeria. A structured questionnaire known as Job Hazards Analysis Instrument (JOHAI) was developed by the researcher for data collection. Data obtained were analyzed using mean, standard deviation, and t-test. Findings from the study revealed that the potential hazards existing in the repairs of radio and television includes electric shock from the power source, serious injury as a result of accidental contact with two poles of a supply, and severe burns which may result from electric sparks during repairs among others. It was also revealed that the techniques for correcting existing potential hazards include among others that personal protective equipment, such as gloves should be worn during repair works, radio/television technicians should be enlightened on the potential hazards involved in the repairs of television set, and respirators should be worm by radio/television technicians to avoid the inhalation of poisonous gases. It was also recommended that radio and television repair/maintenance workers should make safety their utmost priority in the workplace.

Introduction

Maintenance and repair of equipment and machineries is very essential in order to ensure and improve their durability and efficiency. Maintenance according to Schokry (2010) is a set of organized activities that are carried out in order to keep an item in its best operational condition with minimum cost acquired. Maintenance is work that is carried out to preserve equipment in order to enable its continued use and function, over its design service life, without unforeseen renewal or major repair activities. Schokry (2010) explained that the activities of maintenance could be both repair or replacement activities, which are necessary for an item to reach its acceptable productivity condition and these activities, should be carried out with a minimum

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possible cost. Maintenance generally could be preventive, predictive, and corrective. Preventive maintenance according to British Standard 3811 (1993) is the maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning and the effects limited. Predictive maintenance is a set of activities that detect changes in the physical condition of equipment (signs of failure) in order to carry out the appropriate maintenance work for maximizing the service life of equipment without increasing the risk of failure. Corrective maintenance, according to Schokry (2010), are actions such as repair, replacement or restore will be carried out after the occurrence of a failure in order to eliminate the source of this failure or reduce the frequency of its occurrence.

In Nigeria, for instance, many workers involved in the maintenance and repairs of equipment and machineries are injured and killed at the workplace every day. This might be as a result of their lack of adequate knowledge concerning the possible hazards that are involved in the workplace. A hazard according to Occupational Safety and Health Administration (OSHA) (2002) is the potential for harm. It is often associated with a condition or activity that, if left uncontrolled, can result in an injury or illness. Workplace hazards include impact hazards, penetration hazards, compression hazards, chemical hazards, heat/cold, harmful dust, optical radiation, biological hazards, noise hazards, ergonomic, work place violence, harmful dust, smoke and noxious or poisonous gases, among others. Identifying hazards and eliminating or controlling them in the workplace, as early as possible, will help prevent injuries and illnesses. These can only be achieved through a job hazards analysis.

According to (OSHA) (2002) a Job Hazard Analysis (JHA) is a technique that focuses on job tasks as a way to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. A JHA focuses on "fixing" the system or root causes that brought the hazardous condition or unsafe practice into the workplace. Some of it benefits is that it increases worker's or employee's hazard recognition and awareness, standardizes operations based on acceptable safe practices, identifies appropriate Personal Protective Equipment (PPE), and allows formal documentation of employee's knowledge of the job requirements. It can assist in providing early recognition of hazards that may cause an injury or occupational illness, or environmental harm. (OSHA) (2002) explained that JHA is valuable it results to fewer worker injuries and illnesses; safer, more effective work methods; reduced workers' compensation costs; and increased worker productivity. The analysis also can be a valuable tool for training new employees in the steps required to perform their jobs safely.

In an industrial setting, JHA can be conducted as follows: (i) List the Basic Job Steps: each step should be observed by the JHA team. The steps should be discussed, so that everyone understands them, and the reasons the steps are included. The steps should be listed in order of performance; (ii) Determine the potential hazards by asking questions; (iii) List the existing and potential hazards: the existing potential hazards of each step are listed; (iv) Make recommendations to reduce or eliminate or control hazards: Wherever possible eliminate the hazard or substitute a non-hazardous material or condition that will achieve quality results. Where hazards cannot be eliminated, provide engineering controls (barriers, interlocks, tools, etc.) that can reduce or eliminate hazardous conditions. Administrative control (procedures, training, and limit the exposure time) should be

applied to the task where elimination and engineering control are not feasible. When all the previous controls cannot provide hazard reduction, Personal Protective Equipment (PPE) i.e., gloves, respirators, specialized clothing, etc. should be considered. PPE should be the last control considered. Remember that PPE frequently requires specialized training, cleaning, or maintenance, and records may need to be kept.

Like other electronics, the repairs and maintenance of radio and television are also accompanied with hazards, which when not properly identified and analyzed, could lead to severe injuries or death. Many radio and television maintenance and repair workers in Minna metropolis have experienced various forms of hazards, thereby causing various degrees of injury, as well as cases of death. There is a need for a proper hazard analysis, which will identify the hazards involved in repairing television, whereby potential hazards from each step will be identified and listed; and the means for eliminating or controlling the hazards will be determined. Hence, the need for the study.

Purpose of the study

The purpose of the study is to carry out job hazard analysis in the maintenance and repair of radio and television in Minna metropolis. Specifically, the study intends to determine the following:

i.   The potential hazard existing in the repairs of television.
ii. The techniques for correcting existing potential hazards.

Research Questions

The following research questions guided the study

i.   What are the potential hazards existing in the repair of television?

ii. What are the techniques for correcting existing potential hazards?

Hypotheses

The following null hypothesis was formulated and will be tested at 0.05 level of significant:

Ho_1.   There is no significant difference in the mean response of lecturers of electronics and radio/television technicians on the potential hazard existing in the repairs of television.

Ho_2.   There is no significant difference in the mean response of lecturers of electronics and radio/television technicians on the techniques for correcting existing potential hazards.

Methodology

The design used for this study is the cross-sectional survey research design. The study was carried in Minna metropolis of Niger State, Nigeria. The population of the study is made of radio/television technicians and electronics lecturers. A total of eighty-five (85) respondents were used for the study, out of which, 65 are Radio/Television Technicians in Minna metropolis and 20 are Lecturers of electronics from Federal University of Technology, Minna, Niger state, Nigeria. A structured questionnaire known as Job Hazards Analysis Instrument (JOHAI) was developed by the researcher for data collection. The JOHAI was divided into two (2) sections A and B. Section A contains the personal data of the respondent. Section B which contains 27 questionnaire items was further divided into two sub-sections according to the research questions. The instrument was face validated by three Lecturers of electrical/electronic technology in Federal University of Technology, Minna and their comments and suggestions were considered in preparing the final draft of the instrument. The instrument was administered by the researcher with the help of a research assistant in each institution.

Data collected for the study were analyzed using mean, standard deviation, and t-test. A four scale of Strongly Agreed (SA), Agreed (A), Disagreed (D), and Strongly Disagreed (SD) was used with SA=4, A=3, D=2, and SD=1. To determine the acceptance level of items on research questions, a mean of 2.50 and above was considered agreed while any mean below 2.50 was considered disagreed. An inferential statistics t-test was used to test the hypothesis at 0.05 level of significance to compare the mean responses of the two groups.

Results

Research Question 1

What are the potential hazard existing in the repair of television?

Table 1: Mean response of Lecturers of electronics and television technicians on the potential hazard existing in the repairs of television

S.No.	Items	X	SD	DEC	X	SD	DEC
1	Electric shock from the power source	3.86	0.35	A	3.93	0.24	A
2	Electric shock from contact with conductors connected to the main supply	3.22	0.41	A	3.13	0.35	A
3	Serious injury as a result of accidental contact with two poles of a supply	3.15	0.36	A	3.43	0.50	A
4	Shock injury from sharp-edged conductor penetrating of the skin/body	3.30	0.46	A	3.47	0.50	A
5	Severe injury from using testing equipment such as oscilloscope to test dangerous voltages without earth conductor connected	3.75	0.44	A	3.70	0.46	A
6	Dust from the inner part of the television set	3.11	0.32	A	3.17	0.37	A
7	Penetration injuries from contact with sharp object or sharp part of the television set	3.09	0.28	A	3.33	0.47	A
8	Smoke from sparks within the radio/television sets	2.31	0.65	D	2.50	0.96	A
9	Gases from television tube or cathode ray tube (CRT)	3.11	0.32	A	3.20	0.40	A
10	Hazardous materials such as lead and mercury contained on the circuit board of radio/television sets	3.22	0.41	A	3.70	0.46	A
11	Injury resulting from contact with hot soldering bit during the soldering process	3.11	0.32	A	3.37	0.51	A
12	Severe burns may result from electric sparks during repairs	2.78	0.41	A	2.63	0.48	A
13	Potential shock from a power faulty power unit	3.15	0.36	A	3.47	0.50	A
14	Poisonous odour from burnt resistors and capacitors	3.30	0.46	A	3.20	0.40	A
15	Improper handling of tools	2.78	0.41	A	3.33	0.47	A
	Grand Mean & Standard Deviation	3.15	0.39	A	3.31	0.48	A

Key: X= mean, SD= Standard Deviation

The results that emerged from Table 1 reveal that the respondents agreed with all the items concerning the potential hazard existing in the repairs of television.

Research Question 2

What are the techniques for correcting existing potential hazards?

Table 2: Mean response of lecturers of electronics and television technicians on the techniques for correcting existing potential hazards

S.No.	Items	X	SD	DEC	X	SD	DEC
1	Personal protective equipment such as gloves should be worn during repair works	3.39	0.49	A	3.70	0.46	A
2	Radio/Television technicians should be enlightened on the potential hazards involved in the repairs of radio/television set	3.61	0.49	A	3.43	0.50	A
3	There should be adequate work space and lighting system in the work area	3.46	0.49	A	3.53	0.50	A
4	Workshop safety rules and regulation should be adhere to with all seriousness	3.32	0.47	A	3.37	0.44	A
5	The power supply to the television should be disconnected except if highly necessary	3.25	0.44	A	3.47	0.50	A
6	Maintenance workers should give adequate attention to every job	3.46	0.50	A	3.70	0.46	A
7	Respirators should be worm by radio/television technicians to avoid the inhalation of poisonous gases	3.51	0.50	A	3.57	0.49	A
8	Maintenance and repair works on television should only be carried out by competent and qualified individuals	3.23	0.42	A	3.27	0.44	A
9	Access to the repair area should be limited to the competent persons carrying out the repairs in other to avoid distraction	3.40	0.49	A	3.30	0.46	A
10	People other than the maintenance worker who may enter the repairs area from time to time should be instructed about the hazards that may be present	3.34	0.48	A	3.27	0.44	A
11	Equipment in a dangerous condition should never be left unattended to	3.41	0.49	A	3.40	0.49	A
12	Television technicians should carry job hazards analysis periodically	3.15	0.36	A	3.43	0.50	A
	Grand Mean & Standard Deviation	3.38	0.47	A	3.73	0.47	A

The results that emerged from Table 2 above reveal that the respondents agreed with all the items regarding techniques for correcting existing potential hazards.

Hypothesis 1

There is no significant difference in the mean response of Lecturers of electronics and radio/television technicians on the potential hazard existing in the repairs of a radio/television.

Table 3: T-test analysis of the mean responses of lecturers of electronics and radio/television technicians on the potential hazard existing in the repairs of radio/television

Status of Respondents	N	X̄	SD	DF	t-cal	Decision
Lecturers of Electronics	65	3.15	0.39	83	-11.54	Significant
Radio/Television Technicians	20	3.31	0.48			

The analysis in Table 3 above reveals that the t-cal value is more than the t-table value. Therefore, the null hypothesis was rejected regarding the potential hazard existing in the repairs of a radio/television.

Hypothesis 2

There is no significant difference in the mean response of lecturers of electronics and radio/television technicians on the techniques for correcting existing potential hazards.

Table 4: T-test analysis of the mean response of lecturers of electronics and radio/television technicians on the techniques for correcting existing potential hazards

Status of Respondents	N	X̄	SD	DF	t-cal	Decision
Lecturers of Electronics	65	3.38	0.47	83	-24.31	Significant
Radio/Television Technicians	20	3.73	0.47			

The analysis in Table 4 above reveals that the t-cal value is more than the t-table value. Therefore, the null hypothesis was rejected regarding the techniques for correcting existing potential hazards.

Findings of the Study

Below are the summary of the findings from the study

i.   Potential hazards existing in the repair of radio and television includes electric shock from the power source, serious injury as a result of accidental contact with two poles of a supply, severe burns may result from electric sparks during repairs, shock injury from sharp-edged conductor penetrating of the skin/body, and dust from the inner part of the television. Others include smoke from sparks within the radio/television sets, gases from television tube or cathode ray tube (CRT), hazardous materials such as lead and mercury contained on the circuit board of radio/television sets among others.

ii. The techniques for correcting existing potential hazards include personal protective equipment, such as gloves should be worn during repair work, radio/television technicians should be enlightened on the potential hazards involved in the repair of television set, respirators should be worn by radio/television technicians to avoid the inhalation of poisonous gases, workshop safety rules and regulation should be adhered to with all seriousness, maintenance workers should give adequate attention to every job and there should be adequate work space and lighting system in the work area.

Discussion

The findings of this study emerging from Table 1 indicate that the potential hazards existing in the repair of radio and television are electric shock from the power source and serious injury as a result of accidental contact with two poles of a supply. This is in concordance with Health and Safety Executive (HSE) (2001) who opined that the most significant danger to people carrying out electrical testing work is that they might suffer an electric shock. HSE (2002) also explained that any simultaneous contact of a part of the body with a conductor that is live at a dangerous voltage, such as one that is connected to the mains supply, while another part of the body is connected to an earth, will result in an electric shock. Findings also indicated that severe burns may result from electric sparks during repairs. This is also in agreement with HSE (2001) who stressed that there is a risk of burn injuries resulting from arcing when conductors are accidentally short-circuited. Furthermore, finding reveals that other potential hazards existing in the repairs of radio and television could include smoke from sparks within the radio/television sets, gases from television tube or Cathode Ray Tube (CRT), and hazardous materials, such as lead and mercury contained on the circuit board of radio/television sets.

Findings from table 2 indicates that personal protective equipment, such as gloves should be worn during repair works, as a way of correcting the potential hazards existing in the repair of radio and television. Finding also reveals that respirators should be worn by radio/television technicians to avoid the inhalation of poisonous gases. This is in conformity with United States Department for Labour (2003), which stressed that electrical and electronics workers are expected to wear personal

protective equipment during work. Furthermore, findings reveal that radio/television technicians should be enlightened on the potential hazards involved in the repair of radio and television set. Findings also reveal that maintenance workers should give adequate attention to every job and there should be adequate work space and lighting system in the work area. Therefore, there is a need for a proper adherence to these techniques in order to ensure a safe working environment for radio and television repair and maintenance workers.

Findings of the hypotheses on table 3 and 4 show that the null hypothesis was rejected regarding the potential hazards existing in the repair of radio/television and the techniques for correcting the potential hazards existing in the repairs of radio and television, respectively. This means that the respondents share divergent opinion on the potential hazards existing in the repairs of radio/television and the techniques for correcting the potential hazards existing in the repairs of radio and television, respectively.

Conclusion

Based on the findings of the study, it could be concluded that there are numerous hazards that are existing in the repair and maintenance of radio and television. These hazards have the capability of reducing the productivity of the maintenance worker and even death might result in some cases. There is a need to ensure proper adherence to safety rules and techniques so as to achieve a safe and hazard free work environment and experience. Radio and television repair/maintenance workers should make safety their utmost priority in the workplace.

References

British Standard 3811 (1993). Glossary of Terms. Retrieved from on 25th February, 2015 http://www.foxitsoftware.com

Health and Safety Executive (2001). Safety in Electrical Testing: Servicing and Repair of Domestic Appliances Engineering Information Sheet EIS35 HSE Books.

Health and Safety Executive (2002). Safety in Electrical Testing at Work: General Guidance Leaflet INDG354 HSE Books.

Occupational Safety and Health Administration (OSHA) (2002). Job Hazards Analysis. United States Department of Labour. Retrieved on 1st March, 2015 from www.osha.gov/Publications/osha3071.html

Schokry, A. (2010). Introduction to Maintenance. Islamic University of Gaza, Palestine. Retrieved on 25th February, 2015 from http://www.foxitsoftware.com

United States Department of Labor (2003). *Occupational Safety and Health Administration*. Retrieved on 2nd April, 2013 from www.osha.gov/Publications/osha3151.html