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PESTS PROTECTED CABLES: A STRATEGY FOR EFFECTIVE PREVENTION OF FIRE OUTBREAK FROM ELECTRICAL INSTALLATIONS IN WORKSHOPS IN TECHNICAL COLLEGES IN RIVERS STATE

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Abstract
This study on pests protected cables as a strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State was necessitated by the frequent fire outbreak from electrical installation in workshops in technical colleges. A research question and two null hypotheses guided the study. A descriptive survey research design was employed for the study. The population for this study comprised of 45 electrical teachers in four technical colleges in Rivers State. The entire population was studied without sampling since the size was not too large and was manageable. The instrument for data collection was a structured questionnaire titled 'Pest Protected Cables for Effective Prevention of Fire Outbreak from Electrical Installation in Workshops'. The instrument was validated by two experts from the Departments of Industrial Technical Education and Educational Foundations in Ignatius Ajuru University of Education, Port Harcourt. Using the Cronbach alpha method to determine the reliability of the instrument, the reliability co-efficient of 0.78 was obtained. The data collected for the study were analyzed using mean and standard deviation to answer the research questions and to determine the closeness of the respondents' mean ratings. The t-test was used to test the null hypotheses at 0.05 level of significance. The findings of study revealed that pests protected cables will be very effective strategy for prevention of fire outbreak from electrical installations in workshops in technical colleges. The findings also showed that year of experience and location had no significant influence on the opinion of respondents on the effective of peste protected cables as a strategy for prevention of fire outbreak from electrical installations in workshops in technical colleges. Based on the findings of this study, it was recommended that pests protected cables should be used during construction and renovation of workshops among others.
Keywords. Pest protected cables, technical colleges, workshop, fire outbreak.

Introduction

Technical colleges are concerned with production of technicians who are skilled in different fields of human endeavour. The type of technicians produced at technical college level includes electronic/electrical technicians, automobile/metalwork technicians and building/woodwork technicians among others. Training of technicians at technical college involves imparting both theoretical and practical knowledge to students under the guidance of the teacher within the school environment. Students at technical colleges are exposed to different skilled areas, through which one can be trained to be self-reliant. The type of education recurved at technical college level is known as vocational and technical education. Technical colleges according to Akpan (2015)

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provide technical and vocational education and training to students for a particular career and occupation. Vocational and Technical education is an aspect of that leads to acquisition of practical skills as well as basic scientific knowledge (Abel, 2019). At technical college, vocational and technical education is provided to impart technical/occupational skills in the areas of metalwork, woodwork, automobile, electrical, radio, television and electronic works. In the context of this study, technical colleges are government established educational institutions that prepare individuals to acquire practical skills, basic and scientific knowledge and attitude required by craftsmen and technicians at sub-professional levels. Teachers and students in those skill areas carryout practical works at designated workshops.

A workshop is a building were practical training on skill acquisition is carried out. Danga (2022) states that workshop is a workplace where machining, automobile, electrical/electronics, woodwork, fabrication, foundry, forging or welding operations, construction, maintenance or repairs is carried out. Technical colleges' workshop is a unique learning situation in which the learners may experiment, test, construct, disassemble, repair, design, create, imagine and study (Ezeji, 2014). This explains the fact that technical education and its related workshop practices is a programme whereby students acquire industrial-technical knowledge and skills through creative and problem-solving learning experience involving activities such as experimenting, planning, designing, constructing, evaluating and using tools, machines, materials and processes. Every vocational and technical trade or craft has its own workshop for teachers and students' practical works. The major components of workshops are tools, machine, materials and consumables. Some of these tools and machines operates or are energized through electric power. In the context of this study, workshop is a place where mechanical, electrical, electronics, automobile and woodwork practical, training, repair and maintenance is carried out in technical colleges. The functionality and usability of these workshops largely depends on availability of power supply. This account for the electrification of school workshops using effective strategies for prevention fire outbreak from electrical installations.

Fire outbreak is a sudden and unexpected emergence of fire which if not stopped or brought under control could lead to loss of live or property. There are four stages of fire development: ignition, growth, fully developed, and decay. The ignition stage is when all four elements of the fire tetrahedron coalesce, the fuels reach their ignition temperature, and the fire begins. During the growth stage, the fire increases fuel consumption and creates more heat and smoke. The fully developed stage occurs when the maximum amount of fuel and oxidizers are consumed, and the highest heat release rate is produced. The temperature decreases and intensity is reduced during the decay stage, which happens when the available fuel has been consumed (Ethan, 2015). One of fuel that in any electrical installation is the cable especially when they become naked as a result of attack by rodents and pests.

The exposure of cables by pests has intermittently led to fire outbreak occasioned by short circuit. This situation could be prevented when effective fire outbreak preventive strategies are implemented during electric power installations. One of such strategies among others is the use of pest protected cables in electrical installations. Most of the electric fire outbreak according to James (2016) are as a result of degradation of cables due to pest attack. Squirrels, rats, and other rodents may gnaw on unprotected wiring, causing fire and shock hazards (University of Illinois, 2013).The use of pests protected cables repel these pests from damaging cables used for electrical installation; thereby preventing fire outbreak.

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According to Keystone (2020), electrical cables are installed in almost all types of environments, and some are in areas more conducive for exposure to pests, rodents or termites. This is especially so for cables that are buried direct or for underground use cables. Cable materials are attractive to rodents due to the presence of plasticizers and aromatic odours. The colour and texture of the cable sheath material are also attractive to them. Termites live in underground nests deep in the soil. While their basic diet is cellulose, such as organic wastes and roots of plants, once they have consumed natural sources of cellulose, they would look for other manmade sources such as cables. When cables insulation layer is chewed through, there is possibility short circuits occurrence hence becoming a potential source of electrical fire. Therefore, where there is risk of pests, rodents or termites, there is need to consider protective measures or additives to be added to the cables to prevent damage. There are two general methods to protect cables from rodents, pests and termites, which are the use of physical barriers and chemical additives.

For rodent and pest issues, physical barriers that can help to protect the cables against them include the use of conduits and armoring tapes. These barriers are designed to prevent pests and rodents from gnawing on the cables. For fibre optic cables the use of fibre glass yarns is popular where it becomes broken when bitten into and is unpleasant for the rodent (Keystone, 2020). For termites, an effective long-term physical barrier would be Nylon-12, which is a tough material that termites are unable to bite through. In general, these physical methods may last longer, but tend to be costly as well.

Another effective alternative is the use of chemical additives labelled pest resistance (PR), anti-rodent (AR), and anti-termite (AT). Additives are added to the outer sheath of the cable when it is being extruded to provide long lasting effectiveness due to the controlled release of the active ingredients (Keystone, 2020). Example of anti-rodent ingredients include capsaicin (think chilli), which are added and cause the sheath to have a spicy or bitter taste which discourages animals from gnawing on the cables. Since the olfactory sense of animals is superior to humans, the additives give off an unattractive scent to animals but is non-toxic and not detectable to humans. Anti-termite cables on the other hand are treated with insect growth regulators which serves to repel and disrupt their growth and reproduction rather than to exterminate them.

It is obvious that this type of cables were not used during the construction of workshops in technical colleges in Rivers State (Hugh, 2014). This could be of the causes of fire outbreak from electrical installations in workshops technical colleges. However, opinions differ among people on the use of this type of cable. Akin (2016) stated some experts are of the view that the use of pest protected cable will not be a strategy for prevention of fire outbreak from electrical installations based on their location and years of experience. This is contrary to the view of Eaton (2016), who observed that expert's due year of experience are of the opinion that pest protected cables could be among the effective strategies for prevention of fire outbreak from electrical installations. Therefore, the study will examine the views of experts in this direction in terms of years of experience and location.

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Statement of the Problem

Workshops play a pivotal and crucial role in the acquisition of practical skills among students in technical colleges. The skills so acquired through workshop practice shapes the future careers and aspiration of these students in terms occupational specialty. However, the utilization of workshops for practical training in technical colleges in Rivers State sometimes is short lived by incessant fire outbreak result from electrical installations (Dan, 2017). This is usual caused by many factors. Among them is the exposure of cables by pests and rodents. This situation if left unresolved could hamper the objectives and goal of technical colleges; which is the provision of skilled or vocational and technical training to her students.

Undoubtedly, the situation could be avoided if effective strategy for prevention fire outbreak such as pest protected cables may have been used. The researchers therefore sought to investigate the use of pest protected cable as a strategy for effective prevention of fire outbreak in electrical installations in workshops in technical colleges in Rivers State.

Purpose of the Study

The purpose of this study was to examine pest protected cable as a strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges tertiary in Rivers State.

Research Question

The following research questions guided the study.

How effective will the use of pests protected cables prevent fire outbreak from electrical installations in workshops.

Hypotheses

The following null hypotheses were tested at .05 level of significance:

1 there is no significant difference in the mean ratings of respondents on the use of fire retardant and resistant cables as strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State on the basis of location (rural and urban).

2 there is no significant difference in the mean ratings of respondents on the use of pests protected cables as strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State based on years of experience (0 – 10 years and 11year – above).

Methods

A descriptive survey research design was adopted for the study. The population of the study comprised 45 electrical teachers in four technical colleges in Rivers State which are, Government Technical College, Port Harcourt, Ahuoda, Tombia and Ele-Ogu. The entire population was studied since the population is not too large and is manageable. The instrument for data collection was a structured questionnaire with the title: *Pest Protected Cables for Effective Prevention of Fire Outbreak in Electrical Installations in Workshops*. There ratings were as follows; Very Effective (VE), Effective (E), Ineffective (I) and Very Ineffective (VI). The validation of the instrument was done by two experts from the Department of Technical Education; Ignatius Ajuru University of Education. The reliability of the instrument was established using a pilot test involving 20 teachers of technical colleges in Bayelsa State; Data collected for the pilot study were analyzed with Cronbach

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alpha. The reliability coefficient of 0.78 was obtained. The researcher through the support of research assistants sent and retrieved 45 copies of questionnaire for analysis. The data collected for the study were analyzed using the arithmetic mean and standard deviation to answer the research questions and determine the closeness of the responses to the means respectively. The z-test statistical tool was used to test the null hypotheses at 0.05 level of significance. A null hypothesis was rejected where the calculated p-value was less than the 0.05 level of significance which implies that there was a significant difference between mean scores. Conversely, where the calculated p-value was greater than or equal to the level of significance (0.05), it meant that there was no significant difference and the hypothesis was accepted.

Results

***Research Question 1*:** How effective is the use of pests protected cables for prevention of fire outbreak from electrical installations in workshops?

Table 1

Respondents mean ratings on the effectiveness of pests protected cables for prevention of fire outbreak.

SN	Pests Protected Cables	Mean	SD	Remarks
1	Ability to repel pests in non-plasticizer state.	3.51	0.56	VE
2	Ability to repel pests due to its repugnant odour.	3.50	0.50	VE
3	Inability to attract pests due to its colours	3.59	0.49	VE
4	Inability to attract pests due to the texture of the cable sheaths.	3.51	0.54	VE
5	Inability to attract pests due to its non-cellulose content.	3.61	0.41	VE
6	Ability to repel pests due to its addictive content.	3.53	0.47	VE
7	Ability to prevent pests due to its Nylon-12 barrier.	3.50	0.53	VE
8	Ability to discourage pests attack due to its bitter taste.	3.52	0.57	VE
	Cluster Mean	3.52	0.51	VE

Table 1 shows that all the items have a cluster Mean of 3.52, which means that teachers in technical colleges agreed that the use pests protected cables will be very effective for prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State. The standard deviation of 0.51 show that the respondents are homogenous in their opinions.

Hypothesis 1. There is no significant difference in the mean ratings of respondents on the use of pests protected cables as strategy for effective prevention of fire outbreak from electrical installations in workshops technical colleges in Rivers State on the basis of location (rural and urban).

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Table 2
The t-test comparison of the mean ratings on the effectiveness of pests protected cables for prevention of fire outbreak on the basis of location

Teachers' Location	N	$\overline{X}$	SD	df	t-cal.	p-val.	Decision
Urban	30	3.58	.51	43	0.39	.071	Not significant
Rural	15	3.54	.52				

Data in Table 2 show that the respondents do not differ significantly in their mean ratings on the use of pests protected cables as an effective strategy for prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State on the basis of location, with mean scores of 3.58 and 3.54 while the corresponding standard deviation is .51 and .52. The Table indicated a z-value of 0.39, at degree of freedom of 195 and a p-value of .071. Testing at alpha level of 0.05. The p-value is not significant since the p-value is greater than the alpha value (0.05). Therefore, the null hypothesis is not rejected.

Hypothesis 2. There is no significant difference in the mean ratings of respondents on the use of pests protected cables as strategy for effective prevention of fire outbreak from electrical installations in workshops technical colleges in Rivers State based on years of experience (0 – 10 years and 11 year – above).

Table 3
The t-test comparison of the mean ratings on the effectiveness of pests protected cables for prevention of fire outbreak based on year of experience

Years of Experience	N	$\overline{X}$	SD	df	t-cal.	p-val.	Decision
Urban	28	2.05	.12	43	1.54	.063	Not significant
Rural	17	2.13	.14				

Data in Table 3 show that the respondents do not differ significantly in their mean ratings on the use of pest protected cables as an effective strategy for prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State based on years of experience, with mean scores of 2.05 and 2.13, while the corresponding standard deviation is .12 and .14. The Table indicated a t-value of 1.54, at degree of freedom of 195 and a p-value of .063. Testing at alpha level of 0.05, the p-value is not significant, since the p-value is greater than the alpha value (0.05). Therefore, the null hypothesis is not rejected.

Discussion of Findings

The findings of this study revealed that pests protected cables is a strategy for effective prevention of fire outbreak from electrical installations in technical colleges in Rivers State. The strategy was found to repel pests, to be repugnant to pests, unattractive to pests among others. This finding is in agreement with that of Keystone (2020) who noted, where there is risk of pests, rodents or termites, there is need to consider protective barriers or additives to be added to the cables to prevent damage. There are two general methods to protect cables from rodents, pests and termites, which are the use of physical barriers and chemical additives. The analysis of the hypothesis revealed that there is no significant difference in the mean ratings of respondents on the use of pests protected

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cables as a strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State based on location and years of experience of respondents. This finding is in agreement with that of Eaton (2016), who observed that expert's due year of experience are of the opinion that pest protected cables could be among the effective strategies for prevention of fire outbreak from electrical installations. This is contrary to the view of Akin (2016) stated some experts are of the view that the use of pest protected cable will not be a strategy for prevention of fire outbreak from electrical installations based on their location and years of experience.

Conclusion

On the basis of the findings of the study, it was concluded that, pest protected will be a strategy for effective prevention of fire outbreak from electrical installations in workshops in technical colleges in Rivers State.

Recommendations

On the basis of the findings of the study and the conclusion reached, it was recommended that:

1. pests protected cables should be used by contractors during construction and renovation of workshops.
2. the existing non-pest protected cables should be replaced with the pests protected cables by the government through the State Ministry of Education.

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