

ABSTRACT

LED torchlights are used in Nigeria as lighting devices. Its components constitute electronic waste and environmental hazard. Hence, there is a need to repair them to elongate their usage period and reduce electronic waste. To enhance repair process, this research was carried out to determine common faults of this device, the cause of the fault and components that technicians need to be stock to ease replacement bad components. Forty samples of faulty LED torchlights were collected from their respectful users while preventing the users from throwing them to refuse dumps. They were diagnosed, identified the cause of the faults and repaired. An hundred percent (100%) success was recorded. Empirical analysis of the faults through repair showed the least and most common faults of the LED switch and the components that must be stocked. Various causes and preventions of the faults were discussed.

KEYWORDS: LED, Torchlight, Faults, Repair, Electronic Waste.

INTRODUCTION

These LED lighting devices are made of components like capacitors, resistors, diodes, LED, plastics and so on. They constitute electronic waste and environmental hazard. Base on observation of the author that most LED lighting devices or torchlights were found in various refuse dumps. Electronic waste is a great menace to our environment. It must be reduced because it is one of the causes of climate change. Repair elongates their usage period and reduces electronic waste.

A general troubleshooting approach is described as a logical method of narrowing down the problems. This is applicable in electronics, in particular, when repairing an electronic device without repair manual using your knowledge of functions and properties of all the components in the device circuit, in addition to understanding of basic working principle of the device. Repair procedures are various steps and precautions to be followed during repair while using the right tools (Goldwasser, 2014). Technopreneurs are entrepreneurs that make use of business opportunities in technology to acquire incomes for themselves. They can make use of this repair procedures or exposed to business of repairing torchlight to generate millions of naira for themselves. (Thomas, 2013).

MATERIALS AND METHODS***Collection of samples***

Forty faulty led flashlights were collected from different donors in Abeokuta, Ilaro and Lagos (All were cities in Nigeria).

Grouping the sample

Each flashlight circuit was drawn by examining the inter-connection of components on its circuit board. After careful technical examination, it was discovered that the samples were made from three circuit diagrams (Eagleston, 2011). Consequently, the forty samples were grouped into three based on the similarity of their circuit diagram.

Troubleshooting and repair of the sample collector

In other to enhance the process of setting up the simplest and standard method of procedure and steps to be taken for the repair of electronic led flashlight, general repair tips and precautions were taken (Goldwasser, 2014). Furthermore, basic knowledge of components identified in the sample circuits must be acquired (Eagleston, 2011); (Kularatna, 1998); (Thompson, 2006).

Write out the procedure for repair each faults

Each procedure are well written out with special consideration of the newbies with great interest in repair but must have acquired the aforementioned knowledge of components (Higgins, Mobley, & Smith, 2002); (Goldwasser, 2014).

Carry out analysis

The rate of occurrence of a fault in all samples and repair cost were carried out to determine the essence of the repair (Higgins, Mobley, & Smith, 2002).

RESULTS AND DISCUSSION

Table 1. Fault description and analysis

FAULT DESCRIPTION	QUANTITY OF AFFECTED SAMPLES	COST OF FAULTY COMPONENT REPLACED (NAIRA)
Bad switch	12	100
Faulty back-up battery	4	150
Open/short circuit rectifier diode	1	50
Faulty booster capacitor	7	50
Open circuit led	6	30
Open circuit limiting resistor	9	50
Damage ac port	1	70

Considering table 1, the cost of replacement of each component ranges from thirty naira to one hundred and fifty naira, excluding other charges (Higgins, Mobley, & Smith, 2002). The cost of the samples ranges from five hundred naira to three thousand naira. The cost of purchasing each sample is more than this. Hence, there is no need destroying our environment and deny ourselves benefit of enjoying these LED flashlights.

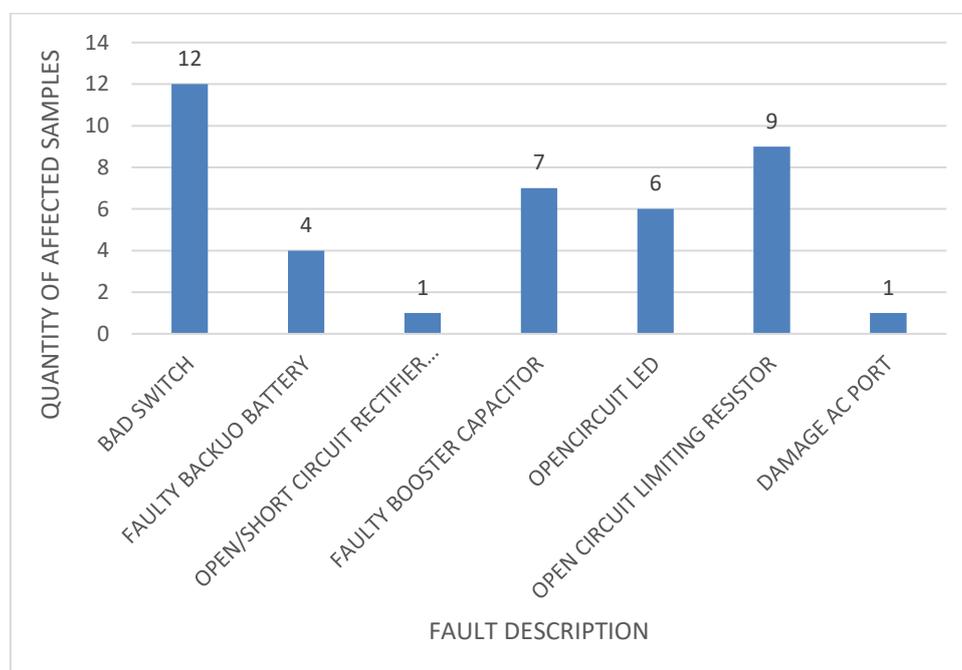


Figure 1: Fault Analysis

Table 1 and figure 1 shows that switch, limiting resistor and booster capacitor are the most unreliable components. Technicians need to stock these components (Higgins, Mobley, & Smith, 2002). The switches were double pole double throw (DPDT) type. The observation showed that corrosion caused it to get stuck and very difficult to moved. Users need avoid getting moisture to be in contact with switch for prevention. Switching the torchlight on

while charging was observed to be the cause of damaged LED, limiting resistor and booster capacitor. It allowed excessing current to pass through them. The instruction on the torchlight which users failed to observe is that it must not be used while charging. Hence, they must not be switched on during charging period to prevent these faults.

Rectifier and AC port are the most reliable components that it must be stocked small quantity. Both components were placed at the input sides of circuits of the collected samples. Hence, if there is no surge or partial contact or dry soldering joint, the components could hardly get damaged or faulty. Failure to charge the battery after excessive usage till the battery runs down might be the cause of the battery problem. Incessant supply of electricity in Nigeria might be a contributing factor. Users might need to switch off the rechargeable LED torchlight once it is observed that the light is not relatively bright and charge it before usage to enhance the usage life of the inbuilt battery.

CONCLUSION

Forty faulty led flashlights were collected from different people and were adopted as sample for the research. The sample were successively repaired with 100% success and returned to the former users. Analysis of the faults shows that option of repair is better than buying another one. This will reduce electronic waste as an added advantage. The most common faulty components are switches, limiting resistors, LEDs and booster capacitor. Faults of this lighting device can be prevented if the users can carefully use it by avoiding moisture contact, switching it off before charge and charging the battery once the light brightness is relatively poor.

ACKNOWLEDGEMENTS

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