

Method of Recycling Integrated Circuits from Printed Circuit Boards

Sushant Lingras
PHINIA

Abstract:- This document presents a method for recycling integrated circuits (ICs) from used printed circuit boards (PCBs), providing detailed steps for identification, screening, preconditioning, and testing of target devices. The method aims to salvage functional ICs from discarded PCBs, reducing electronic waste and promoting environmental sustainability. Additionally, it outlines the construction of new PCBs using the recycled ICs, contributing to resource conservation and efficient electronic component utilization.

I. INTRODUCTION

The method described herein offers a systematic approach to recycle target devices, particularly integrated circuits, from used printed circuit boards (PCBs). By salvaging functional components from discarded electronics, this method addresses the growing concern of electronic waste accumulation and the depletion of valuable resources. Through rigorous screening and testing processes, viable ICs are identified and prepared for reuse in the fabrication of new PCBs, thereby extending the lifespan of electronic components and reducing environmental impact.

II. METHOD OVERVIEW

The recycling process involves several key steps, including identification of target devices, screening for physical damage, preconditioning, and functional testing. These steps ensure the quality and reliability of recycled ICs, enabling their integration into new PCBs with the same configuration as the original ones.

A. Identification of Target Devices

The method begins with the identification of target devices on used PCBs. If a target device cannot be located or identified, the PCB is rejected, ensuring that only viable components proceed to the recycling process.

B. Screening Process

A comprehensive screening process is conducted to assess the physical condition of both the PCB and the target device. This includes visual inspections for damage such as burn marks, fire damage, bent or broken connector pins, and non-parallel connector pins. Additionally, data associated with the PCB is compared against predefined criteria to determine its suitability for recycling.

C. Preconditioning

Accepted PCBs undergo a preconditioning step, involving baking in an oven at elevated temperatures to prepare them for component removal. This process ensures the removal of moisture and contaminants, enhancing the reliability of the recycled components.

D. Component Removal and Testing

The target device is desoldered from the PCB and subjected to visual inspection and functional testing. Visual inspections verify the integrity of the device, while functional tests assess its electrical performance. Acceptable devices are designated for reuse, while defective ones are discarded.

E. Storage and Further Processing

Accepted target devices may undergo additional heat treatment and are stored in electrostatic-discharge-protected environments to maintain their integrity. These devices are then used in the construction of new PCBs with identical configurations to the originals, completing the recycling process.

III. DETAILED METHOD DESCRIPTION

The method is further detailed through a step-by-step process, including specific temperature and time parameters for preconditioning and heat treatment. It also encompasses the construction of new PCBs using recycled components, ensuring the seamless integration of salvaged ICs into functional electronic systems.

IV. CONCLUSION

The method presented offers an efficient and environmentally sustainable solution for recycling integrated circuits from printed circuit boards. By salvaging and reusing functional components, this approach contributes to the reduction of electronic waste and promotes the efficient utilization of valuable resources. Moreover, the integration of recycled ICs into new PCBs extends their lifespan and supports the development of sustainable electronic systems.

REFERENCES

- [1]. X. Niu et al. Treatment of waste printed wire boards in electronic waste for safe disposal J. Hazard. Mater. (2007)
- [2]. H. Duan *et al.* Examining the technology acceptance for dismantling of waste printed circuit boards in light of recycling and environmental concerns J. Environ. Manag. (2011)
- [3]. K. Huang *et al.* Recycling of waste printed circuit boards: a review of current technologies and treatment status in China J. Hazard Mater. (2009)
- [4]. F.P.C. Silvas *et al.* Printed circuit board recycling: physical processing and copper extraction by selective leaching Waste Manag. (2015)