

# LATEST TRENDS IN THE DESIGN CONSIDERATIONS OF ECO FRIENDLY ELECTRONICS AND COMMUNICATION DEVICES

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## Abstract

*Electronics and Communication devices have changed the human life styles tremendously comfortable with many advantages, but they have brought in some side effects on our environment.*

*The aim of this theoretical research paper is to select one of the main factors, study, analyse, discuss and propose some design considerations for eco friendly electronic devices. One of the main factors in the design of these devices causing biggest harm to environment is the usage of hazardous materials for manufacture of computers and related electronic products.*

*In this paper an attempt is made to present and discuss some design considerations and implications on the usage of environmental friendly materials in the design and fabrication of these devices. Also, in this paper some proposals are included for further research and usage of newer materials which does not contain hazardous substances for design and fabrication of electronic and communication devices.*

**Keywords:**— Eco friendly Electronic Devices, Green Electronics, ECCIT devices

## I. INTRODUCTION

Electronics and communication devices have revolutionised society after innovations of semiconductors, IC's, Chips through VLSI technologies. Modern man has many devices in his office, home and on mobility. In India there are about 600 million cello phones and there number will reach 870 million in near future excluding laptops, home appliances and desktop PC's. These devices have changed the human life styles tremendously comfortable with many advantages, but they have brought in some side effects on our environment which is termed as e-pollution. Hence there is an inescapable requirement to plug this problem at the design stage for eco friendly electronic devices.

It is well known fact that hazardous materials such as brominated flame-retardants, PVCs and heavy metals like lead, cadmium and mercury are commonly used for

manufacture of computers and related other electronics equipment which are known to cause harm to the environment and human lives. Hazardous substances are contained within components such as printed circuit boards, cables, wiring, plastics, casings, displays monitors, cathode ray tubes (CRT), batteries, capacitors, resistors, relays and connectors and so on the land filling of these hazardous materials risks the leaching of heavy metals like lead, cadmium and mercury into ground water or evaporation of mercury into air. The main factors contributing for increase the usage of hazardous material through Electronics, Communication, Computers and IT ECCIT devices into the world are follows.

- (a) Technology innovation for IT equipment is tremendously advancing.
- (b) Consumption and sales of ECCIT devices is increasing in an exponential scale.
- (c) These devices have become more affordable and accessible due to mass production.
- (d) The rate of introduction of new devices/models in large numbers is just 15 days.
- (e) There is an urgent need to find suitable newer materials for design and manufacture of environmental friendly electronics and communication devices for future of human kind.

## II. PROPOSED METHODOLOGY

Performance and profit making should not be the main criteria for any Electronics and Communication product. Also along with this the ill effects they bring must be environmentally sustainable. Methodologies for designing, manufacturing, using and disposing of these products such as computer peripherals, storage media, printers, monitors, consumer electronics, networking equipment and communication equipment should be such that it is efficient and effective at the same time with minimum or no impact on environment.

Designing, manufacturing, using and disposing of these products along with associated subsystems efficiently and effectively with minimum or no impact on environment can be termed as Green Electronics. One of the main goals of



this Green Electronics is similar to green chemistry, reduce the use of hazardous materials during design and manufacturing. The proposed methodology in this paper envisages some design considerations and implications for environmental friendly electronic devices.

**Design Considerations for ECCIT materials**

- (a) The materials used for design and manufacture should be able to be broken down by natural processes.
- (b) They should be more sustainable and less toxic plastics and bio-plastics (monitor casings).
- (c) Consider usage of biodegradable corn-based plastic case for printers.
- (d) Consider wood and bamboo wood encased designs for desktops in computer towers, monitors and mouse controls.
- (e) There is need to consider design of monitors which do not emit toxic radiations.
- (f) Materials used are required to consume as less power as possible. Intel's core 2 Duo processor draws power only for the parts of the chip which are actually in use.
- (g) Fast forward the research and bring in the nanotechnology products which are eco friendly into the design.
- (h) They must emit less dioxins.
- (i) Material should be such when it is disposed of in to landfills, ground water should not get affected and in case of burning must emit less harmful fumes.
- (j) Before using the material for design it must undergo biodegradability test which need to be developed by research.
- (k) Adhere to any legislation for not to use banned substances at the design stage itself.

Sl No	Component/ equipment	Existing materials	Proposed materials eco friendly
1	Computer parts	Copper, lead, mercury, steel	Gold/silver/ bronze/ copper/ steel
2	Mother Board	Beryllium	Wooden composites
3	Chips & semi conductors	Cadmium	Hafnium or composites
4	PCB's	Lead	Lead free solder
5	Cathode Ray Tube	Barium, mercury, lead	LCD/ LED technologies are suitable composites

6	Wires & cables	Copper and aluminium	Super conducting materials
7	Toner cartridge	Toner	Bio based resins
8	Plastic housing of electronic components	Brominated flame retardant	Copper based flame retardant composites

Table 1. Hardware with materials used and proposed

**Implications of Proposed ECCIT Materials**

With introduction of eco friendly materials for design of ECCIT devices the following factors will have to be accepted.

- (a) Cost considerations will certainly go high.
- (b) Size and weight factors are most likely \* will increase.
- (c) Imposition of strong legislation attracts protests from designers/manufacturers because they need profits and resentment from consumers since they need performance.

**III. DISCUSSION**

The issue of hazardous material pumped in to the world through ECCIT devices is assuming alarming proportions. It is estimated that approximately 20 kg of this material is put into market every year per inhabitant which is about 10 million tonnes per year. An estimated 50 million tonnes of E-waste is produced every year.

This implies 400 kg of hazardous material is used by designers which is pumped into the market every year per inhabitant which is almost 2500 million tonnes every year in form of new products. The introduction of hazardous material in the form of new products is likely to increase by 500 percent in India in near future. It is estimated that USA produces about 3 million tonnes of E-waste and introduces 9 million tonnes of this material in the form of new products. In case of China it introduces 2.3 million tonnes of E-waste and 7-9 million tonnes in new products.

It is estimated that 70% of e-waste is put in to landfills where as 30% is either burned out or re-cycled.

Inference from this research is that entry of hazardous material into the society in the form of new products is exponentially rising compared to E-waste production. Even though the size, weight of eco friendly ECCIT devices will be slightly inconvenience to use but they eliminate harmful effects on society is great preventive act.



The harmful effects and the overheads involved in the disposal of e-waste will more than compensate for the cost and weight factors in usage of eco friendly materials for design of ECCIT devices.

#### IV. CONCLUSION

The main contribution of this paper is the idea of plugging the hazardous material usage problem at the design stage itself. This is to ensure that prevention of creation of e-waste into the environment and society.

The present methodology of usage of harmful materials such as lead, cadmium barium for design and manufacture of ECCIT devices must have to be replaced by the Eco friendly materials which are proposed in this paper.

It may not be very easy to design, develop and manufacture the ECCIT devices with Eco friendly materials, but there is no escape for protection of environment. If not followed by ECCIT manufacturers, there is a need for comprehensive strong legislation covering all aspects of ECCIT devices.

Research continues at a very large scale in many organizations across the world into many areas of making use of ECCIT devices energy efficient, designing algorithms, manufacturing, designing and usage methods for eco friendliness as far as possible.

The case of difficulty in designing the Eco friendly ECCIT products is understood but recent advances in galloping technologies including materials will go a long way in solving the usage of less hazardous material for design of ECCIT devices. The following proposals are made through this research paper.

- (a) Manufacturers have to accept the hazards to environment leaving the desire for profits alone.
- (b) Consumers also have to compromise on performance factor for usage of environmental friendly materials.
- (c) Extended producer responsibility must be encouraged whereby those who produce ECCIT goods are responsible for the environmental impacts throughout the whole life cycle.
- (d) Use of nanotechnology for the design.
- (e) Based on electrical (permittivity) and mechanical properties (Permeability) research has to be carried out for determination of environmental friendliness of materials and then use for design of ECCIT devices
- (f) A strong standard legislation is required to be imposed after comprehensive research into the issues of eco friendly ECCIT devices

- (g) Discipline of consumers in usage methods goes a long way in ensuring environment friendliness.

#### V. FUTURE SCOPE

Future scope exists for comprehensive research for investigation and development of environmental friendly composite materials and also for defining standards.

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