RECYCLING AND REUSING THE E-WASTE

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Abstract:

Every year industry develops a new technology & in the entire world the use of electronic products has grown substantially over the past two decades, changing the way & speed of communication. Rapid changes in technology, low initial cost & planned obsolescence have resulted in fast growing surplus of electronic waste around the globe. The world produces about 40 millions tones of waste from electronic devices known as E-Waste. Large quantity of unused electronic waste causes serious pollution problem, environmental & health hazards because it contains some very serious contaminants such as CRTs, PCB, Silicon, Carbon, Arsenic, Cadmium, Mercury etc. but the e-waste also contains many valuable, recoverable materials such as aluminum, copper, gold, silver, plastic& tin. In order to conserve natural resources & the energy needed to produce new electronic equipment can be refurbished, reused & recycled instead of being land filled by tacking out the harmful contain from it. As the earth is turning into giant garbage of e-waste its recycling is necessary. Recycling is the method of retrieving operable parts & ingredients from unusable electronic devices. [1]

Like that we can produce anything from the old one. Also the wires of the old circuit can be used for next one. So, from the whole condition given above, recycling of e-waste is very essential as it saves energy, expenses, reduce environmental pollution & less chances of health hazardous.

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I. INTRODUCTION:

"As the technology Changes,

Its effects are also seen on the world".

As we move in the 21st century, the some engine of innovation that drove us out of the garage will take us to a future where technology is more pervasive, more intuitive & more relevant to society than ever before. We're continuously aligning our technology & environment strategies to address sustainability challenges today & invest in ways to accelerate the low-carbon economy tomorrow. Our technology breath & industry reach give us an unmatched ability to make the kind of impact that is good for business, good for customer & good for planet. [5]

I. *What is 'E-Waste'?*

E-waste is a popular, informal name for electronic products coming to the end of their "useful life". "Electronic Waste" may be defined as all secondary computers, entertainment device electronic, mobile phones & other items such as television sets & refrigerators, whether sold, donated, or discarded by the original owners. This definition includes used electronic which are destined for reuse, resale, salvage, recycling or disposal. Other defined the re-usable (Working & Repairable Electronics) & secondary scrap (copper, steel, plastic etc) to be "Commodities" & Reserve the term "Waste" for residue or material which was represented as working or repairable but which is dumped or disposed discarded by the buyer rather than recycled, because loads of surplus electronics are frequently commingled, several public policy advocates apply the "E-Waste" broadly to all surplus electronics. [3]

II. *What is "E-cycling"?*

E Cycling is the process, which involves recovering of valuable material from old electronic that can be used to make new Products. E Cycling refers to the process of Reproducing the components or metals contained in used or discarded electronic equipments. The recycling is done because the natural Resources are limited. This helps in reducing the price of electronic goods & also in saving Energy, which will be wastage in extracting the metal from the ore. E Cycling will only raise the product & waste management cost of e-waste for consumers & limit innovation on part of high tech companies.

Fig.1

III. *E-waste typically includes common electronic items such as:*

- Computers, Televisions, DVD Players, VCR's, Cell phones, Video Games, MP3 Players, Microwaves & Include all electronic circuitry.

II. NECESSITY:

- It must be recycled as the natural resources are limited in quantity.
- It will help in reducing the price of electronic goods and also in saving energy, which will be wasted in extracting the metals from their ore
- Unless action is stepped up to properly collect and recycle materials, many developing countries face the specter of hazardous e-waste mountains with serious consequences for the environment and public health.

- Instead of disposing e-waste it should be recycled for other uses. The country is benefited from the recycled products.
- Also the products will be recycled in low cost[6][7]
- Exposure to these toxic chemicals contained in e-waste, can damage the nervous system & the brain, affects liver & kidney, & can cause birth defects.

III. CAUSES OF ELECTRONIC WASTE:

1. The un-sustainability of discarding electronics & computer technology leads to electronic waste.
2. The complexity of the various items to be disposed of the cost of environmentally approved recycling system & the need for concern action to collect & systematically process equipment are challenges.
3. Because of salvaging & recycling of products by unregulated operator in unsafe conditions, the products may get damaged & are further not useful.
4. Rapid technology change, low initial cost & planned obsolescence has resulted in a fast growing surplus of electronic waste. [1]

Fig.2

5. As the competition increases in the market, technology changes faster & faster & this technology replace the old equipment by new once.[6]
6. Research field is also responsible for electronic waste that replaces the old one.
7. Now a day's Electronic products have made our life easy by saving time and being efficient. Now it has become difficult for us to function without electronic equipments. These become out dated after some limited period. This one is the big cause for e-waste.
8. The various mobile phones, which are becoming much cheaper also leads to e-waste.[7]

Ex: Cell phones coming from different country are very much cheaper to buy & Sold & having no Guaranty & Warrantee. Therefore this is one of the causes of Electronic waste.

Fig.3

IV. PROCESS OF RECYCLING OF E-WASTE:

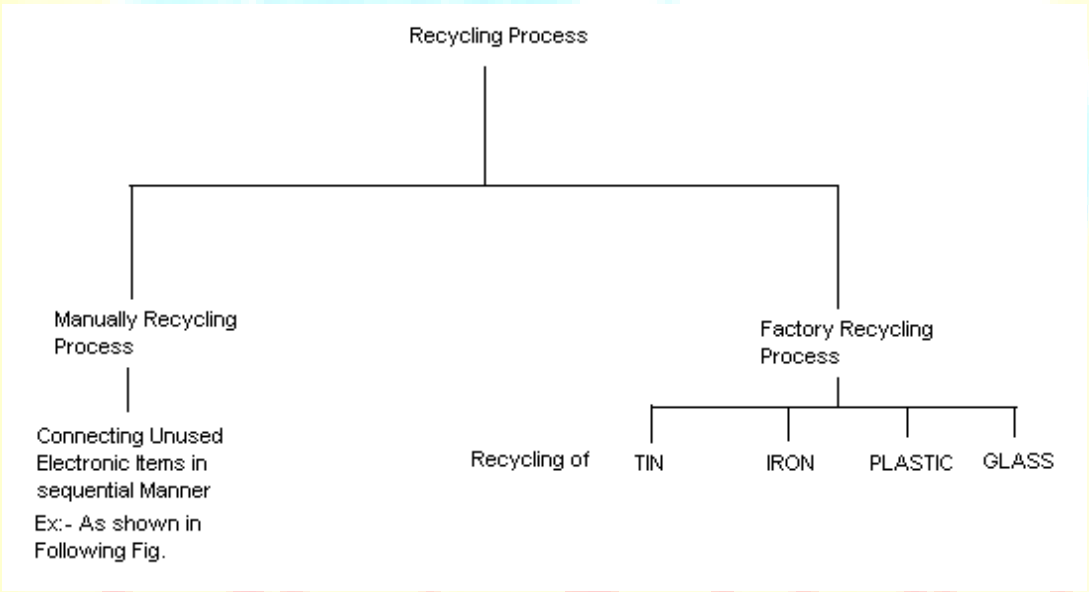


Fig.4: Examples of manually recycling process

The process of recycling of e-waste is basically classified follows:

- Factory Recycling Process
- Manually Recycling Process

A. Factory Recycling Process:

The various electronic hardware are separated into parts like glass, plastic, iron, tin, lead etc. & then melted & process further which is used to produce the products i.e. the glass of unused monitor can be recycled to produce a new one. E-Waste process that carries out mechanical process (Such as dismantling, crushing or grinding) and/or chemical process will be required to obtained solid waste processing permits.

In an alternative bulk system, a hopper conveys material for shredding into a sophisticated mechanical separator, with screening and granulating machines to separate constituent metal and plastic fractions, which are sold to smelters or plastics recyclers. Such recycling machinery is enclosed and employs a dust collection system

Fig.5. Recycling Process

Magnets, eddy currents, and trammel screens are employed to separate glass, plastic, and ferrous and nonferrous metals, which can then be further separated at a smelter. Leaded glass from CRTs is reused in car batteries, ammunition, and lead wheel weights, or sold to foundries as a fluxing agent in processing raw lead ore. Copper, gold, palladium, silver, and tin are valuable metals sold to smelters for recycling. Hazardous smoke and gases are captured, contained, and treated to mitigate environmental threat. These methods allow for safe reclamation of all

valuable computer construction materials. Reuse is an option to recycling because it extends the life space of device. [3][6]

B. Manually Recycling Process:

Computer monitors are typically packed into low stacks on wooden pallets for recycling and then shrink-wrapped. It is done by connecting various unused electronic parts with each other in sequential manner or according to the idea often by hands In developed countries, electronic waste processing usually first involves dismantling the equipment into various parts (metal frames, power supplies, circuit boards, pl

Ex: By connecting various unused wires, we can made those items as shown in figure –

Figure 6

V. WHERE CAN YOU RECYCLE?

Less waste can translate into more Jobs, a stronger economy, energy conservation, less pollution, extended lives existing landfills, a reduce need for new landfills & the preservation of the natural resources

- In Your Home , College, Office , In Your Community , Industry

A. At Your College:

In the college campus, there are many damage electronic items like unused mouse, keyboard & short circuited IC's, resistor etc. which are of no more used at all. They are like garbage. By connecting them with each other in sequential manner, anyone can produce a beautiful, decorative, useful item as shown in fig. with low cost.

B. At Your Industry:

Electronic waste include plastic, tin, iron etc. which can be recycled by melting it in a factory at different temperature as required as for different substances as given above & according to that they should be used for next one.

Fig.7

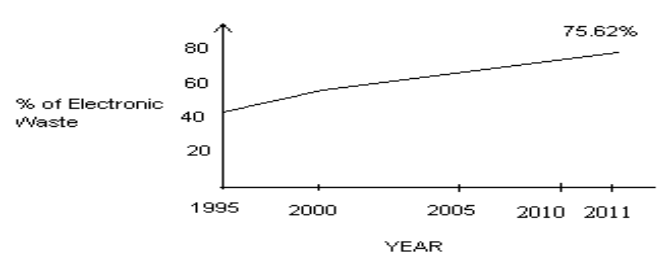
Ex: Broken glass of monitor can be processed further & used for another items. As per that, Recycling is done anywhere, where we want to recycle & it is nothing but a big research in e-waste field. [3]

VI. E-WASTE MANAGEMENT METHOD

Equipment reuse (with or without repair)

1. Material recycling
2. Landfill disposal in permitted municipal solid waste landfills (Currently approved for all generator)
3. Reuse of whole units: Reuse functioning electronic equipment by donating it to someone who can still use it.
4. Repair/refurbishment/remanufacturing of units
5. Recovery/reuse of functional peripherals or components
6. Recycling of constituent materials: Recycle those components that cannot be repaired.
7. Last. Responsible disposal of hazardous and non-hazardous waste in permitted landfills. [5]

VII. LITERATURE SURVEY



As per shown in the graph every year the % of electronic waste overall the world are going on increasing. From that literature survey, the following points should be taken into consideration.

- An estimated 50 million tones of E-waste is produced each year.
- The USA discards 30 million computers each year
- & 100 million phones are disposed of in Europe each year.
- In the United States, an estimated 70% of heavy metals in landfills comes from discarded electronics, while electronic waste represents only 2% of America's trash in landfills.[7]
- The EPA states that unwanted electronics totaled 2 million tons in 2005.
- The U.S. National Safety Council estimates that 75% of all personal computers ever sold are now gathering dust as surplus electronics.
- While some recycle, 7% of cellphone owners still throw away their old cell phone.[3]
- In US, Consumer electronic products alone account for approximately 40% of lead found in the landfills
- Some 12 million tones of electronic waste will be dumped into American landfills.

Fig.8

VIII. ELECTRONIC WASTE SUBSTANCES

Some electronic components can be reused in assembling new computer products, while others are reduced to metals that can be reused in applications as varied as construction, flatware, and jewelry. [1][2]

Substances found in large quantities include epoxy resins, fiberglass, PCBs, PVC, thermosetting plastics, lead, tin, copper, silicon, beryllium, carbon, iron and aluminum. Elements found in small amounts include cadmium, mercury, and thallium.

Elements found in trace amounts include americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium.

A. Hazardous:

- Americium: smoke alarms (radioactive source).
- Mercury: fluorescent tubes (numerous applications), tilt switches (pinball games, mechanical doorbells, thermostats). With new technologies arising, the elimination of mercury in many new-model computers is taking place.
- Sulfur: lead-acid batteries.

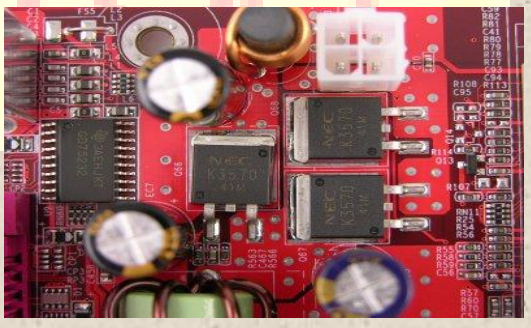


Fig.9

- PCBs: prior to ban, almost all 1930s–1970s equipment, including capacitors, transformers, wiring insulation, paints, inks, and flexible sealants.
- Cadmium: light-sensitive resistors, corrosion- resistant alloys for marine and aviation environments, nickel-cadmium batteries.
- Lead: old solder, CRT monitor glass, lead-acid batteries, some formulations of PVC. A typical 15-inch cathode ray tube may contain 1.5 pounds of lead, but other CRTs have been estimated as having up to 8 pounds of lead.
- Beryllium oxide: filler in some thermal interface materials such as thermal grease used on heat sinks for CPUs and power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers

B. Generally Nonhazardous:

- Tin: solder, coatings on component leads.
- Copper: copper wire, printed circuit board tracks, component leads.
- Aluminium: nearly all electronic goods using more than a few watts of power (heatsinks), electrolytic capacitors.
- Iron: steel chassis, cases, and fixings.
- Germanium: 1950s–1960s transistorized electronics (bipolar junction transistors).
- Silicon: glass, transistors, ICs, printed circuit boards.
- Nickel: nickel-cadmium batteries.
- Lithium: lithium-ion batteries.
- Zinc: plating for steel parts.
- Gold: connector plating, primarily in computer equipment

IX. BENEFITS OF RECYCLING

1. Recycling creates jobs and strengthens the economy.
2. Recycling saves energy.
3. Recycling prevents soil, water, and air pollution, including greenhouse gases.
4. Recycling conserves our natural resources.
5. Recycling extends the lives of existing landfills and reduces the need for new landfills.[1]
6. E-waste contains many valuable, recoverable materials such as aluminum, copper, gold, silver, plastics, and ferrous metals. In order to conserve natural resources and the energy needed to produce new electronic equipment from virgin resources, electronic equipment can be refurbished, reused, and recycled instead of being land filled.
7. Conserves natural resources. Recycling recovers valuable materials from old electronics that can be used to make new products. As a result, we save energy, reduce pollution, reduce greenhouse gas emissions, and save resources by extracting fewer raw materials from the earth.[4]
8. Protects your surroundings. Safe recycling of outdated electronics promotes sound management of toxic chemicals such as lead and mercury.

Fig.10: Reuse of unused keyboard (Junk Art)

9. Helps others. Donating your used electronics benefits your community by passing on ready-to-use or refurbished equipment to those who need it.
10. Create Jobs. E Cycling creates jobs for professional recyclers and refurbishes and creates new markets for the valuable components that are dismantled.
11. Saves landfill space. E-waste is a growing waste stream. By recycling these items, landfill space is conserved. [2]

X. CONCLUSION

Thus, Recycling of E-Waste is directly concerned with the pollution & environmental problems & indirectly related with each & every electronic devices that we use in our day-to-day life. From the entire condition, it is observed that we are responsible for e-waste & we can only reduce it by applying our own creative/innovative ideas. By reducing & separating electronic equipment back to its original material with minimum or no disassembly, it will help to conserve natural resources, to reduce the trouble of environment pollution, to produce the more employment & save energy. Recycling is the easiest way & perfect solution for the e-waste. At last I only want to say that

"RECYCLE E-WASTE

DON'T THROW IT"

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