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E-waste and its management

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Abstract
The fastest technology growth and development turns the world to an electronic city. The development of various technical equipments after their usage becomes waste i.e. e-waste. These discarded e-wastes consist of ferrous and non-ferrous metals, plastic, glass, ceramics, rubber etc. Even though e-waste is a valuable source for secondary raw material it is harmful if treated and discarded improperly as it contains many toxic components such as lead, cadmium, mercury, polychlorinated biphenyls etc. The hazardous waste are termed with the presence of lead, mercury, arsenic, cadmium, selenium and hexavalent chromium and flame retardants in excess quantities. There exists certain recovery process without the release of hazardous waste.

Keywords: e-waste, toxic, raw material, recovery, non-ferrous metals

1. Introduction
Electronic waste or e-waste explains about discarded electrical or electronic devices. The EOL (End-of-Life) electronics and that are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste.

Fig 1: Electronic wastes

2. E-waste- Harmful one
Today's technology in use leads to tomorrow's advancement. But the technical gadgets that are not in present environment usage is also the e-waste. Nearly 93 percent of electronic waste can be recycled. However, unregulated recycling can causes pollution. Televisions and CRT monitors contain on average of four pounds of lead (the exact amount depends on size and make). The leading source of municipal waste is considered as electronics that has mercury. In addition, brominated flame retardants contains high amount of toxic content and persistence which are commonly added to plastics used in electronics. These toxics can be released into the environment, if improperly handled. This potentially places our health and subsistence resources at risk.

3. Impacts of E-waste on the environment

E-waste that naturally has its impact on the environment. Mostly the improper disposal of the electronic waste from all sorts of electronics ranging from computers and mobile phones, to household electronics such as food processors, pressure, cookers pollutes the nature adversely. The impact of electronic waste affects soil, air and water.

3.1 Effects on air

The most common effect of e-waste is air pollution. Improper disposal of electronic waste through air contaminates air. The burning of e-waste leads to release of toxic substance like hydrocarbons into the air. This causes various health hazards to all the living beings.

3.2 Effects on water

The illegitimate disposal of heavy metals such as lead, barium, mercury, lithium (found in mobile phone and computer batteries), etc. leach through the soil and reaches groundwater. This results in poisoning of ground water.

3.3 Effects on soil

The toxic heavy metals and chemicals from e-waste enter the "soil-crop-food pathway," which is the significant routes for heavy metals' exposure to humans. These chemicals are not biodegradable and they remain in the soil for long periods of time that increases the risk of exposure. This affects the human body by damaging the brain, heart, liver, kidney, skeletal system and the nervous system. Not only humans it ultimately poses grave dangers to livestock.

Fig 2: E-waste dumped in water resource area

4. E-waste recycling and recovery

The approximate amount of e-waste produced each year in the world is about 50 million tons and is increasing. Several techniques are emerging to avoid environmental contamination in e-waste recycling and recovery. India has established "Recycling and Treatment and Disposal Facilities" to dispose hazardous wastes.

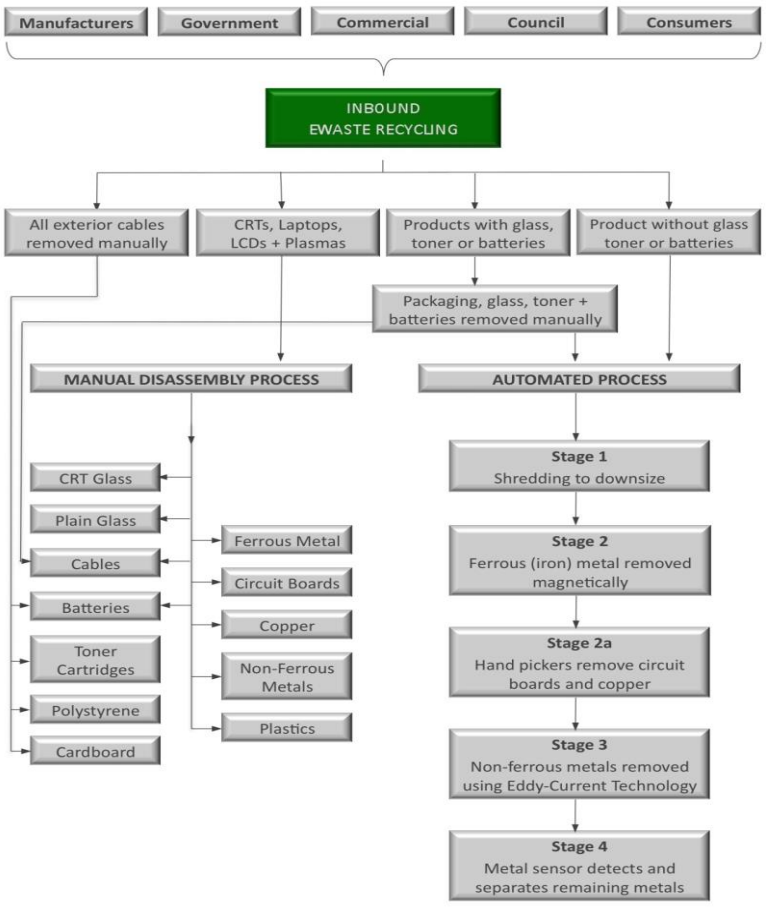

Fig 3: E-waste recycling

Facility Operation Requirements

1. Collection
2. Storage
3. Dismantling & Segregation
4. Recycling
5. Treatment & Disposal

4.1 Plastic Recycling

The three different types of plastic recycling process involved are chemical recycling, mechanical recycling and thermal recycling. In mechanical recycling, a new plastic product is formed by shredding and identification process. Thermal recycling process uses plastics as alternative fuel. The two major types of plastic resins are "thermosets" and "thermoplastics" are used in electronics. Thermosets cannot be re-melted and formed into new products and so they are shredded and recycled, where thermoplastics can be re-melted and formed into new products.

4.2 CRT Recycling Process

The two main components in CRT recycling process is that glass (SiO2, NaO, CaO, coloring, oxidizing and X-ray protection components (K2O, MgO, ZnO, BaO, PbO) and non-glass components (plastics, steel, copper, electron gun, phosphor coating). The glass to glass and glass to lead recycling are the present techniques available for CRT recycling.

The following technologies by India for non-CRT e-waste treatment,

1. Dismantling
2. Pulverization/ Hammering
3. Shredding
4. Density separation using water

4.3 Metals Recovery

Metals recycling concentrates on lead recycling, copper recycling and precious metals recycling. The separation of metallic components usually done through magnetic and eddy current separators. Copper electrolysis process is used in precious metal recovery like gold, palladium, platinum, etc.

4.4 Lead Recovery

The technologies used for lead recovery from e-waste fraction are Reverberatory furnace and blast furnace.

5. Conclusion

The use of electronic goods cannot be avoided and it can be reduced and recycled to a greater extend. Inappropriate recycling also causes hazardous damage to lifecycle of all living beings.

Some of the ways that can probably reduce the effects of e-waste recycling:

1. Cross check with the local government on laws and regulations guiding ethical and safe disposal of these waste.
2. The donation of electronics promotes the reuse of the e-waste disposed and this can reduce pollution caused by e-waste and also give access to people who would not otherwise have access to these devices.
3. The use of certified E-waste recycler which is an ethical and safe recycler certified through the Basel Action Network (BAN), a non-profit organization promotes proper recycling process.

With the consideration of all the above statements and as responsible citizens must mindful of the dangers posed by E-waste to the environment and do as much as to protect the environment. The e-waste not just affects the environment, it causes several changes in the health and life cycle of the living beings.

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