E-WASTE


Alkaline batteries:
toxic landfill after one use


KIRKLAND
Energizer
DURACELL
MAXPOWER
Ni-MH 900


LetsGoMobile

Did You Know?

Today's Electronic **Gadgets**, Tomorrow's Electronic **Waste !!!**

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- ✓ Introduction
- ✓ What is Electronic Waste?
- ✓ Why so much ado about E-Waste?
- ✓ Sources of E-Waste
- ✓ How these become E-Waste?
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INTRODUCTION

Total No. of **PC** users in India is Over

80 Million

+

INTRODUCTION

Total No. of **MOBILE** users in India

- India has **554.8 million** mobile users.
- These users actively use 643.4 million SIMs actively.

+

"As many as 3,000 personal computers; 8,500 mobile handsets; 5,500 TV sets and are dismantled in the Delhi everyday for reuse of their component parts and materials"

What is Electronic Waste?

It may be defined as, computers, office electronic equipment, entertainment devices & many other electronic or electrical devices which are unwanted, broken & discarded by their original users
are known as ‘E-Waste’ or ‘Electronic Waste’

Why so much ado about E-Waste?

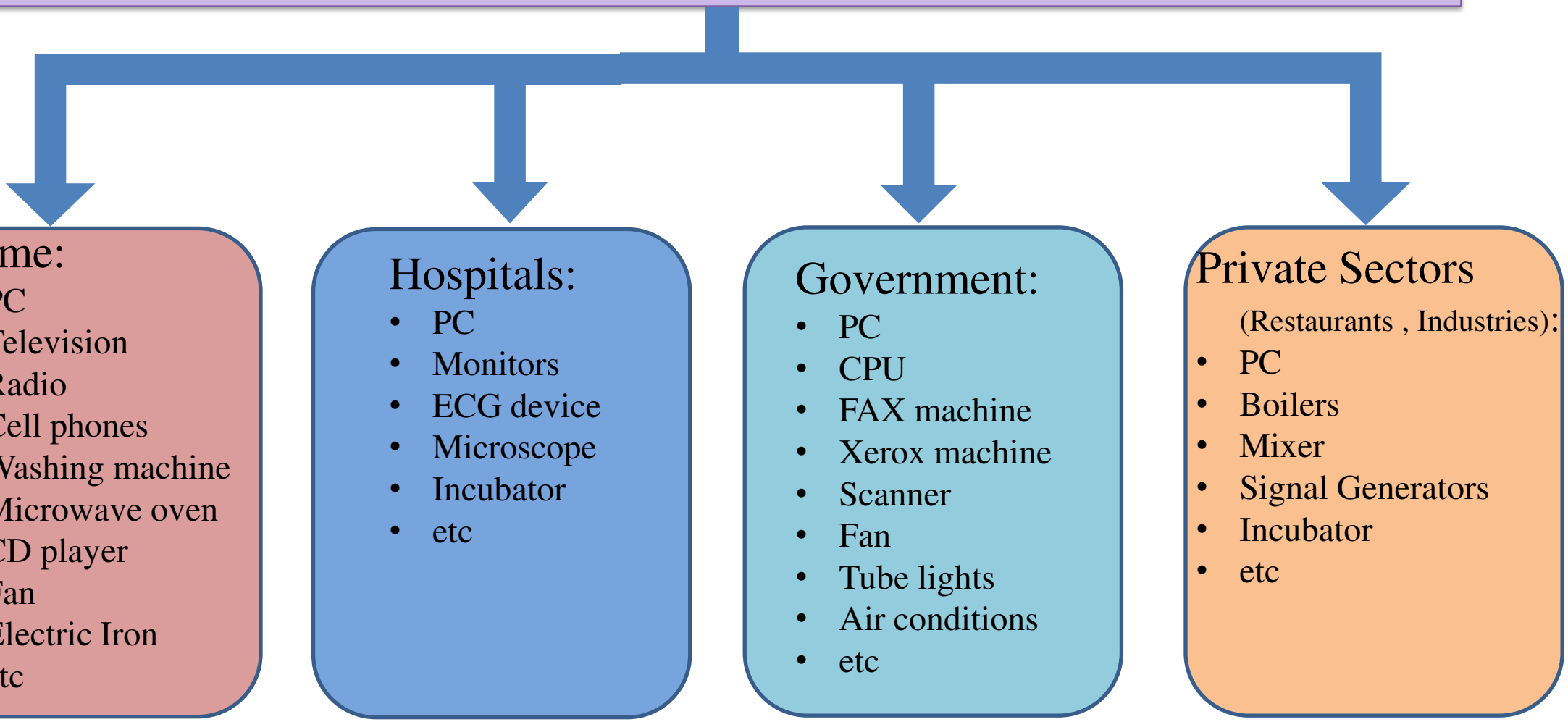
- An estimated 50 million tons of E-waste are produced each year.
- The USA discards 30 million computers each year & 100 million phones are disposed of in Europe each year.
- The Environmental Protection Agency estimates that only 15-20% of E-Waste is recycled, the rest of these electronics go directly into landfills and incinerators.

Why so much ado about E-Waste?

- E-Waste contains several different substances and chemicals, many of which are toxic and are likely to create adverse impact on environment and health, if not handled properly.

- However, classification of E-Waste as hazardous or otherwise shall depend upon the extent of presence of hazardous constituents in it.

Sources of E-Waste:



Categories of E-Waste

- Large household appliances
- Small household appliances
- IT & Telecommunication equipment
- Consumer equipment
- Lighting equipment
- Electrical and electronic tools
- Toys and sport equipment
- Medical devices
- Monitoring and control instruments
- automatic dispensers

How these become E-Waste?

Reasons:

- Advancement in technology
- Changes in Style, Fashion & Status
- Nearing the end of their useful life
- Not taking precautions while handling them

Constituents of E-Waste:

E-Waste Source	E-Waste Component	Environmental Hazard	Effects on Human
CRTs (used in TVs, Monitors, ATM, Video Camera, etc), Batteries, PVC cables, Paints	Lead, barium & other heavy metals	These metals leaching into the ground water and release of toxic phosphor	Anemia, Renal Toxicity, Insomnia
Batteries, Housing & Medical Equipment	Mercury	Air emissions as well as discharge into rivers of glass dust	Renal Toxicity, Muscle tumors, Mental retardation, Cerebral palsy
Plastics from printers, keyboards, monitors, etc	plasticizer bisephenol-A(or BPA), as well DEHP and DBP, plastic compounds known as phthalates	Chlorinated plastics release harmful chemicals into the surrounding soil, which seep into ground water or other surrounding water sources which cause serious harm to the species that drink this water.	Risk in developing heart problems, obesity, reproductive disease
PVC & polymer, Paints, Printing inks, Electrical transformers & capacitors	Polychlorinated Biphenyls (PCBs)	include extreme pollution from production, toxic chemical exposure during use, hazards from fires	Suppression of immune system; Damage to the liver, nervous and reproductive systems

E-Waste Disposal

A Problem & Challenge !!!

- Landfill disposal allows heavy metals to leach into ground water
- Incineration makes hazardous material airborne
- Acid baths are dangerous and cause water and soil contamination
- Exported materials are handled improperly
  - Most E-Waste goes to China, India & Africa
    - Workers are untrained and uneducated in safe handling of electronic waste
    - No environmental protection laws

E-Waste Disposal

Methods of treatment & disposal:

- *Landfill*
- *Incineration*
- *Pyrolysis*
- *Recycle & Reuse*

Existing E-Waste Management Practices in India :-

- *Plastic Waste :*

Products made from plastics such as keyboards, casing, front or real panel.
Miscellaneous parts encased in plastics
Management Practice - The shredding & melting

- *Printed Circuit Board Waste:*

Used in electronic parts such as motherboard, TV internal circuits, etc
Management Practice – De soldering & open burning to remove metals.

Continue…

- *Miscellaneous Waste:*

  Chips, electronic wires, broken glass waste, copper containing waste.

Management Practice- Chemical stripping & open burning & some of the waste is mixed with the municipal solid waste

- *Liquid Waste:*

  It contains internal chemicals, general waste, acid stripping waste.

Management Practice – Sewerage system

Recycling of E-Waste

- ***Disassembly/dismantling*** :

  Disassembly is the systematic removal of components, parts, a group of parts or a subassembly from a product which is in E-Waste

- ***Upgrading :***

  It includes comminuting and separation of materials using mechanical / physical and/or metallurgical processing. Methods to recover materials include incineration and refining.

- ***Materials Recovery*** :

  The material are recovered by recycling facilities. The plastic, glass, metals can be recovered by sorting them before mixing with other waste.

PIRANHA PLASTICS

PLASTICS RECYCLING OVERVIEW

WHAT HAPPENS TO PLASTIC THAT IS RECYCLED BY US?

Plastic is made into new products which are resold on the open market

Call PIRANHA for Pick-up

Pick-up Process

Plastic is transported to PIRANHA factory

Stored in Warehouse

Sent on for further processing

Plastic is inspected and sorted

Sent on for further processing

Plastic Material is chopped up into small pieces, washed with biodegradable soap and water

Plastic Grind packed for shipment

Packed in boxes

Shipped to Partner Facility for final processing

R4 Initiative

PIRANHA INTERNATIONAL LTD

Ref:http://piranhatt.com/plastics-about.html

Advantages of Recycling E-Waste :

- Asset recovery
- Reduction of need for landfills
- Reduction of junks and clutters
- Resale and Reuse
- Creation of jobs

Wanna
be a
Super-
Hero ???

Reuse of E-Waste

- Reuse is the environmentally preferable option for managing older electronics equipment
- By extending the useful life of old products, reuse conserves the energy and raw materials needed to manufacture new products and doing so reduces the pollution
- Reuse also gives people who cannot afford new products access to electronic equipment at reduced or at low cost
- Almost all domestic and part of imported E-Waste are reused in following ways:
  - Direct second-hand use
  - Use after repair or slight modification
  - Use of some parts like monitor cabinet, main board for making new appliances

Environmental Protection Agency(EPA)

- List of EPA - Worldwide:
    i. Earth System Governance Project
    ii. Global Environment Facility(GEF)
    iii. Intergovernmental Panel on Climate Change(IPCC)
    iv. United Nations Environment Program me(UNEP)
    v. World Nature Organization(WNO)
    vi. World Wide Fund For Nature(WWF)

Environmental Protection Agency(EPA)

- List of EPA - INDIA:
    i. Central Pollution Control Board(CPCB)
    ii. Gujarat Pollution Control Board
    iii. Ministry of Environment and Forests
    iv. Andhra Pradesh Pollution Control Board(APPCB)

CONCLUSION

1. As far as e-waste is concerned, it has emerged as one of the fastest growing waste streams world wide today.
2. Electronic equipment is one of the largest know sources of heavy metals without effective collection, reuse, and recycling systems, they will be dangerous to environment
3. Reuse and recycling of electronic equipment is a beneficial alternative than disposal
4. Product design by using safe and environment friendly raw materials and most emerging technologies
5. Awareness of e-waste
6. Implementation of legislation

Implement Proper E-Waste Disposal

One man's 'junk' is other man's 'Treasure' !

(Anon)

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- **Reduce**
  To use things with care to reduce the amount of waste generated
- **Reuse**
  To repeat use of items or parts of items
- **Recycle**
  To use waste as resources


Thank you!

HOSPITAL WASTE MANAGEMENT

HOSPITAL WASTE MANAGEMENT

1. Introduction
2. Definition
3. Classification of health care waste
4. Sources of health care waste
5. Health hazards of health care waste
6. Treatment and disposal technologies
7. Biomedical waste in india

HOSPITAL WASTE MANAGEMENT

INTRODUCTION

The waste produced in the course of health-care activities carries a higher potential for infection and injury than any other type of waste. Therefore, it is essential to have safe and reliable method for its handling. Inadequate and inappropriate handling of health-care waste may have serious public health consequences and a significant impact on the environment. Appropriate management of health-care waste is thus a crucial component of environmental health protection, and it should become an integral feature of health-care services.

Let the waste of the "sick"
not contaminate the lives of
"The Healthy"

DEFINITION

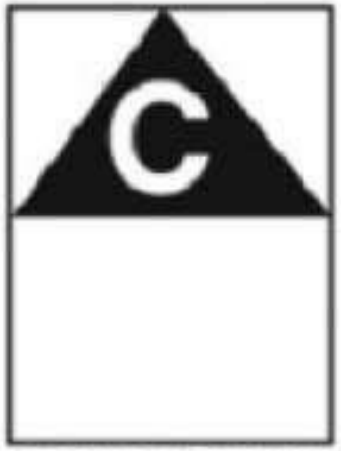
- According to Bio-Medical Waste (Management and Handling) Rules, 1998 of India, "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals.

Schedule III: Label for Bio-Medical Waste Containers/Bags

BIOHAZARD SYMBOL
जैविक परिसंकट चिन्ह

BIOHAZARD
जैविक परिसंकट

CYTOTOXIC HAZARD SYMBOL
कोषिकाविष परिसंकट चिन्ह



CYTOTOXIC
कोषिकाविष

WHO Classification

Waste Categories	Description and Examples
1.General Waste	No risk to human health eg:office paper,wrapper,kitchen waste,general sweeping etc.
2.Pathological Waste	Human Tissue or fluid eg:body parts,blood,body fluids etc.
3.Sharps	Sharp waste eg:Needle,scaples,knives,blades etc.
4.Infectious waste	Which may transmit bacterial,viral or parasitica disease to human being,waste suspected to contain pathogen eg:labrotory culture,tissues(swabs)bandage etc.

5.Chemical waste	Eg:Labrotory reagent,disInfectants,Film Developer
6.Radio-active waste	Eg: unused liquid from radiotherapy or lab research,contaminated glasswares etc.
7.Pharmacutical Waste	Expired outdated drugs /chemicals
8.Pressurized container	Gas cylinder,aerosal cans etc
9.Genotoxic Waste	Waste Containing Cytotoxic Drugs(often Used In Cancer Therapy)

SOURCES OF HEALTH CARE WASTE

- The institutions involved in generation of bio-medical waste are :
- - Government hospitals
- - Private hospitals
- - Nursing homes
- - Physician's office/clinics
- - Dentist's office/clinics
- - Dispensaries
- - Primary health centres
- - Medical research and training establishments
- - Animal houses
- - Slaughter houses
- - Laboratories
- - Research organizations
- - Vaccinating centres
- - Biotechnologies institutions
- - Blood banks

All these health-care establishments generate waste and are therefore covered under Bio-Medical Waste (BMW) Rules.

HEALTH HAZARDS OF HEALTH CARE WASTE

- Exposure to hazardous health-care waste can result in disease or injury due to one or more of the following characteristics :

(a) it contains infectious agents

(b) it contains toxic or hazardous chemicals

(c) it contains sharps

(d) it is genotoxic

(e) it is radio-active.

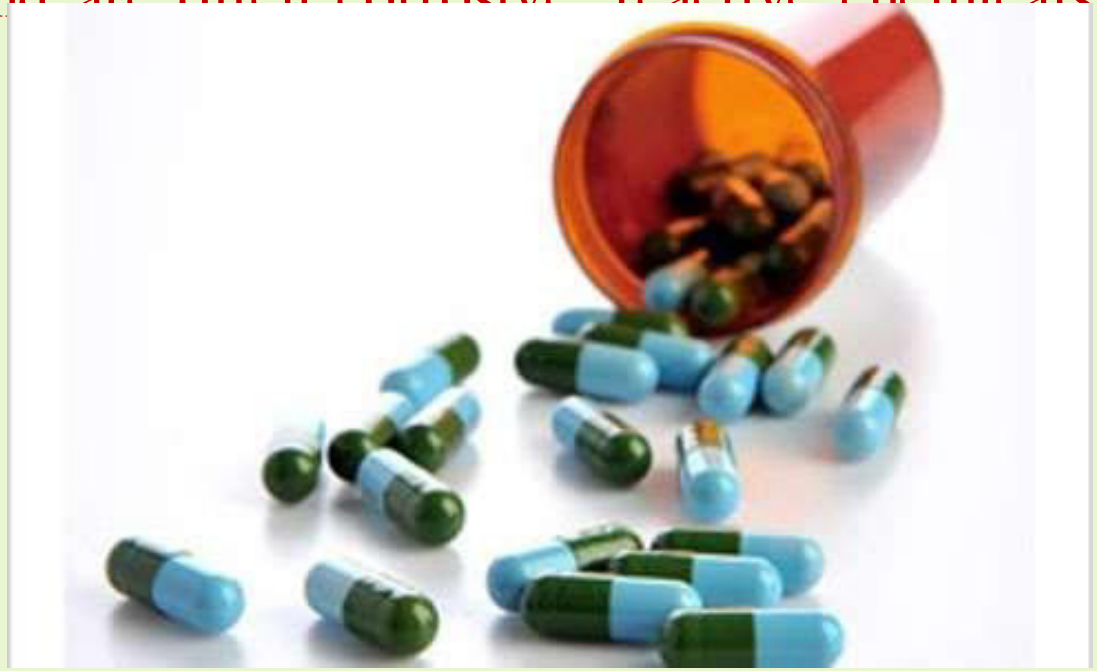
- All individuals exposed to such hazardous health-care waste are potentially at risk, including those who generate the waste or those who either handle such waste or are exposed to it as a consequence of careless management.
- The main groups at risk are : medical doctors, nurses, health-care auxiliaries, and hospital maintenance personnel etc.

[1] HAZARDS FROM INFECTIOUS WASTE AND SHARPS

- Pathogens in infectious waste may enter the human body through a puncture, abrasion or cut in the skin, through mucous membranes by Inhalation or by Ingestion. There is particular concern about infection with HIV and hepatitis virus B and C, for which there is a strong evidence of transmission via health-care waste. Bacterias resistant to antibiotics and chemical disinfectants, may also contribute to the hazards created by poorly managed waste.

[2] HAZARDS FROM CHEMICAL AND PHARMACEUTICAL WASTE

- Many of the chemicals and pharmaceuticals used in health-care establishments are toxic, genotoxic, corrosive, flammable, reactive, explosive or shock-sensitive. Although present in small quantity they may cause intoxication, either by acute or chronic exposure, and injuries, including burns. Disinfectants are particularly important members of this group. They are used in large quantities and are often corrosive, reactive chemicals may form highly toxic secondary compounds.



[3] HAZARD FROM GENOTOXIC WASTE

- The severity of the hazards for health-care worker responsible for handling or disposal of genotoxic waste is governed by a combination of the substance toxicity itself and the extent and duration of exposure. Exposure may also occur during the preparation of or treatment with particular drug or chemical. The main pathway of exposure is inhalation of dust or aerosols, absorption through the skin, ingestion of food accidentally contaminated with cytotoxic drugs, chemicals or wastes etc.

[4] HAZARD FROM RADIOACTIVE WASTE

- The type of disease caused by radioactive waste is determined by the type and extent of exposure. It can range from headache, dizziness and vomiting to much more serious problems. Because it is genotoxic, it may also affect genetic material.

[5] PUBLIC SENSITIVITY

- Apart from health hazards, the general public is very sensitive to visual impact of health-care waste particularly anatomical waste.

TREATMENT AND DISPOSAL TECHNOLOGIES FOR

- **Incineration,**

used to be the method of choice for most hazardous health-care wastes, and is still widely used. However, recently developed alternative treatment methods are becoming increasingly popular.

1. ***INCINERATION***
2. ***CHEMICAL DISINFECTION***
3. ***WET AND DRY THERMAL TREATMENT***
4. ***MICROWAVE IRRADIATION***
5. ***LAND DISPOSAL***

[1] INCINERATION

- Incineration is a high temperature dry oxidation process, that reduces organic and combustible waste to inorganic incombustible matter and results in a very significant reduction of waste-volume and weight. The process is usually selected to treat wastes that cannot be recycled, reused or disposed off in a land fill site.

The INCINERATOR

Characteristics of the waste suitable for incineration are :

(a) low heating volume - above 2000 kcal/kg for single - chamber incinerators, and above 3500 kcal/kg for pryolytic double-chamber incinerators.

(b) content of combustible matter above 60 per cent.

(c) content of noncombustible solids below 5 per cent.

TYPES OF INCINERATORS

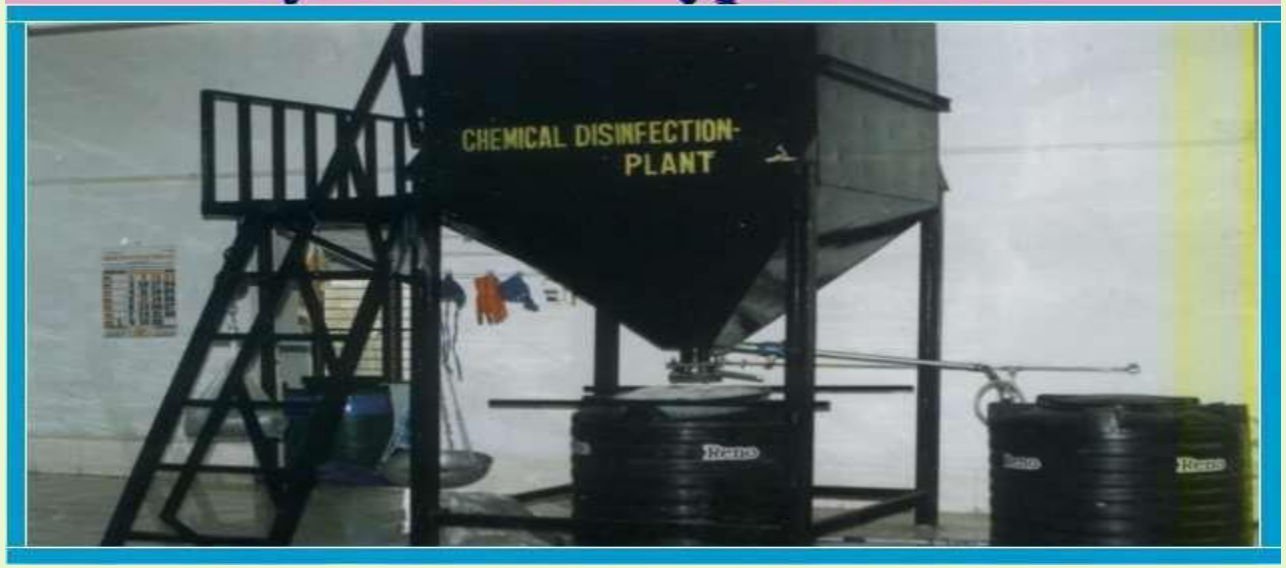
Incinerators can range from very basic combustion unit that operates at much lower temperature to extremely sophisticated, high temperature operating plants. It should be carefully chosen on the basis of the available resources, the local situation, and the risk- benefit consideration.

- Three basic kinds of incineration technology are of interest for treating health-care waste :
- (a) Double-chamber pyrolytic incinerators which may be especially designed to burn infectious health-care waste;
- (b) Single-chamber furnaces with static grate, which should be used only if pyrolytic incinerators are not affordable; and
- (c) Rotary kilns operating at high temperatures, capable of causing decomposition of genotoxic substances and heat-resistant chemicals.

[2] CHEMICAL DISINFECTION

- Chemicals are added to waste to kill or inactivate the pathogens it contains, this treatment usually results in disinfection rather than sterilization. Chemical disinfection is most suitable for treating liquid waste such as blood, urine, stools or hospital sewage. However, solid wastes including microbiological cultures, sharps etc. may also be disinfected chemically with certain limitations.

Bio Medical Plastic Wastes Disinfection by Sodium Hypochlorite

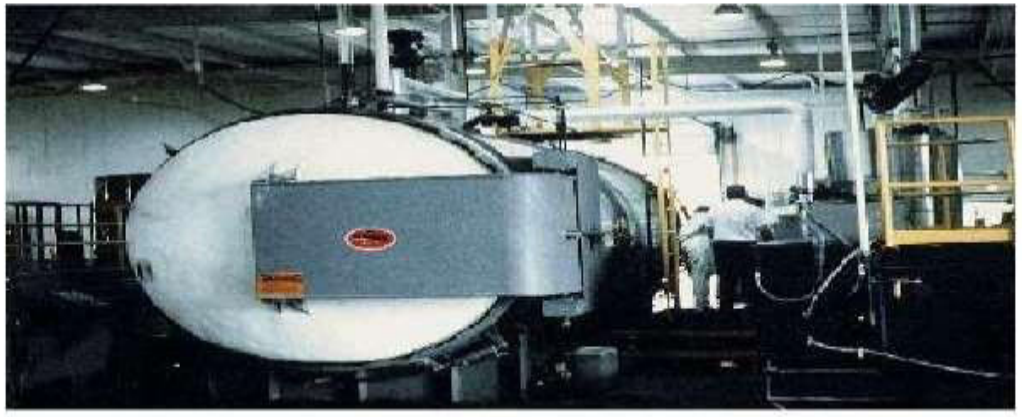


[3] WET AND DRY THERMAL TREATMENT

- **WET THERMAL TREATMENT**

Wet thermal treatment or steam disinfection is based on exposure of shredded infectious waste to high temperature, high pressure steam, and is similar to the autoclave sterilization process. The process is inappropriate for the treatment of anatomical waste and animal carcassess, and will not efficiently treat chemical and pharmaceutical waste.

Off-site wet thermal (or "steam autoclave") treatment facility

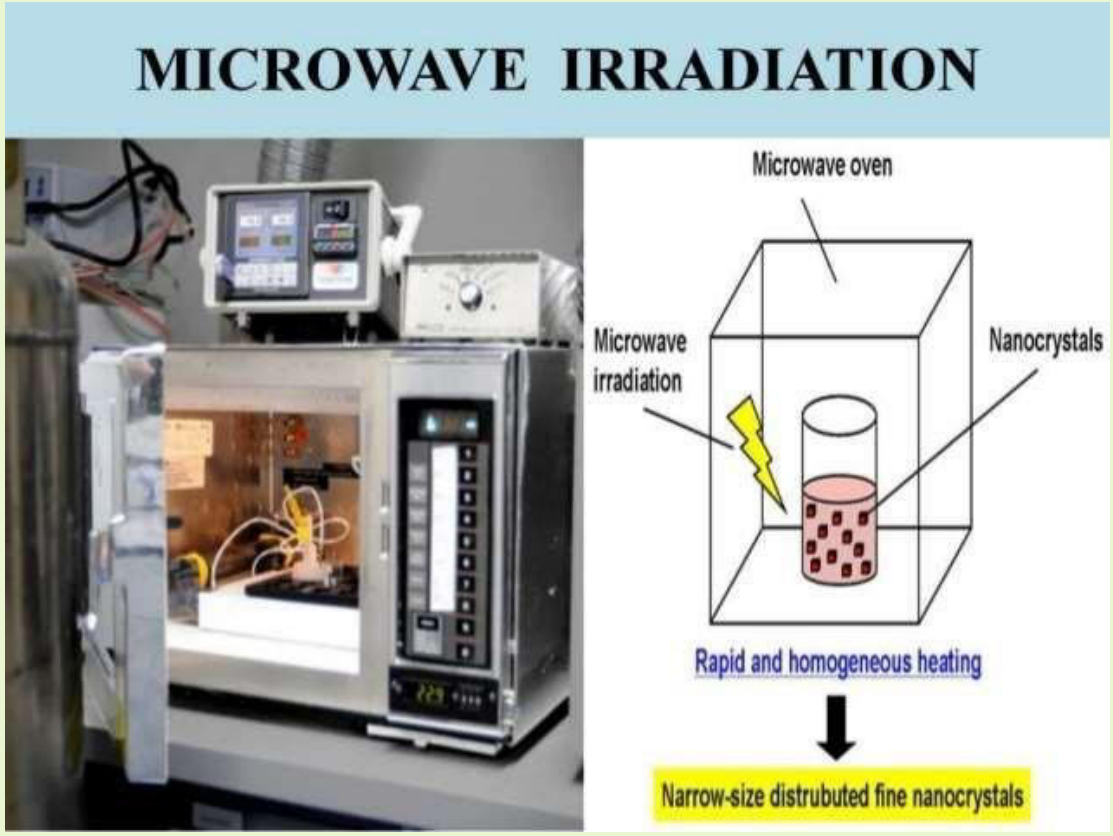


SCREW-FEED TECHNOLOGY

Screw-feed technology is the basis of a non-burn, dry thermal disinfection process in which waste is shredded and heated in a rotating auger. The waste is reduced by 80 per cent in volume and by 20-35 per cent in weight. This process is suitable for treating infectious waste and sharps, but it should not be used to process pathological, cytotoxic or radioactive waste.

[4]MICROWAVE IRRADIATION

- Most microorganisms are destroyed by the action of microwave of a frequency of about 2450 MHz and a wave length of 12.24 nm. The water contained within the waste is rapidly heated by the microwaves and the infectious components are destroyed by heat conduction. The efficiency of the microwave disinfection should be checked routinely through bacteriological and virological tests.

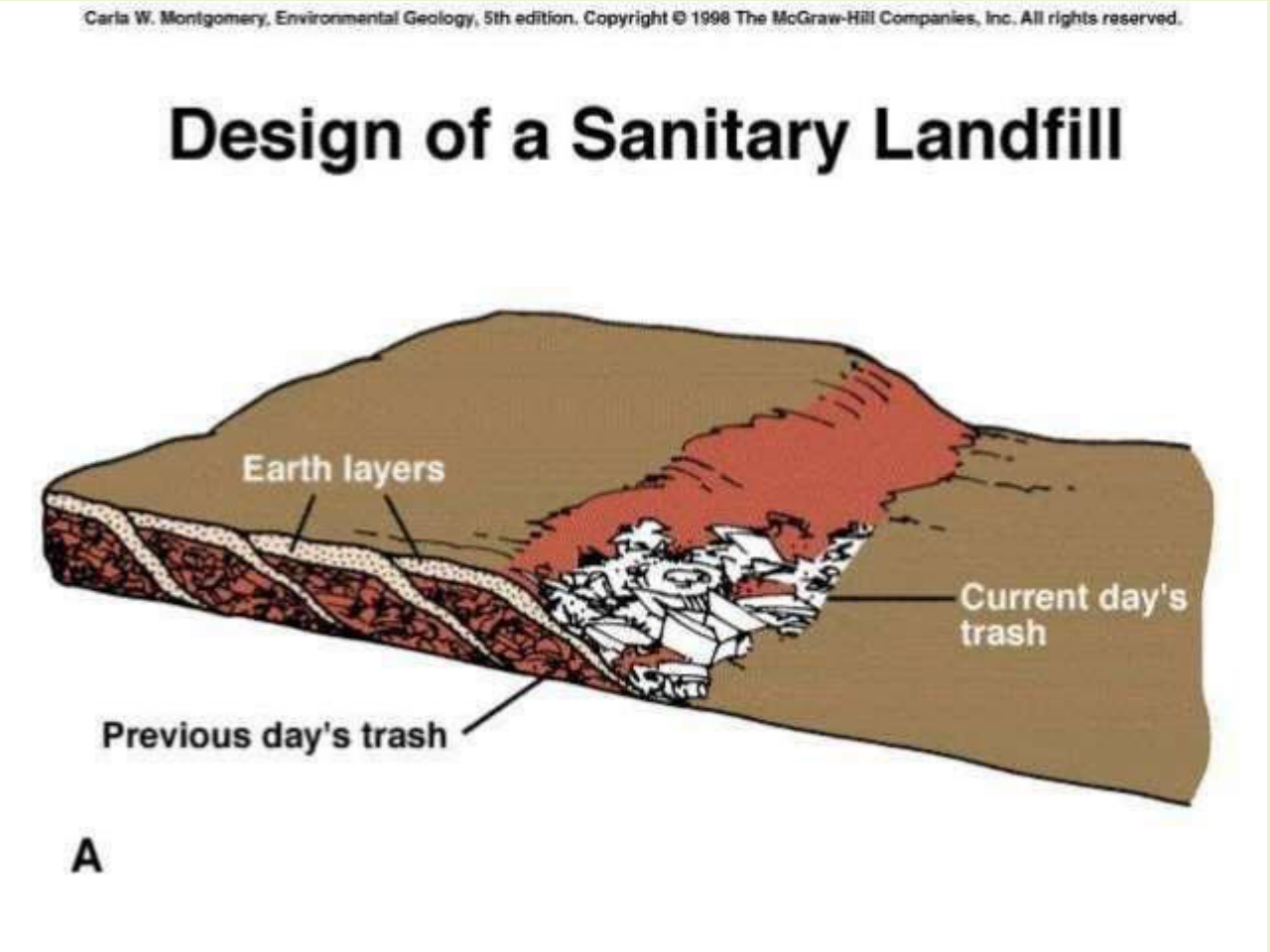


[5] LAND DISPOSAL

- ***MUNICIPAL DISPOSAL SITES***

If a municipality or medical authority genuinely lacks the means to treat waste b-efore disposal, the use of a land fill has to be regarded as an acceptable disposal route. There are two types of disposal land-open dumps and sanitary landfills. Health-care waste should not be deposited on or around open dumps. The risk of either people or animals coming into contact with infectious pathogens is obvious.

- Sanitary landfills are designed to have at least four advantages over open dumps : geological isolation of waste from the environment, appropriate engineering preparation before the site is ready to accept waste, staff present on site to control operations, and organized deposit and daily coverage of waste.



[6] INERTIZATION

- The process of "inertization" involves mixing waste with cement and other substances before disposal, in order to minimize the risk of toxic substances contained in the wastes migrating into the surface water or ground water. A typical proportion of the mixture is: 65 per cent pharmaceutical waste, 15 per cent lime, 15 per cent cement and 5 per cent water. A homogeneous mass is formed and cubes or pellets are produced on site and then transported to suitable storage sites.
- **The United Nations Conference on the Environment and Development (UNCED) in 1992 recommended the following measures :**

(a) Prevent and minimize waste production

(b) Reuse or recycle the waste to the extent possible

(c) Treat waste by safe and environmentally sound methods, and

(d) Dispose off the final residue by landfill in confined and carefully designed sites.

- Most **recommended**
- Involves mixing of the waste with a mixture of water, lime and cement
- Transported in liquid state and poured into municipal waste

INERTIZATION

TREATMENT/DISPOSAL METHOD	ADVANTAGES	DISADVANTAGES
[1] ROTARY KILN	Adequate for all infectious waste, most chemical waste and pharmaceutical waste.	High investment and operating costs.
[2] PYROLYTIC INCINERATION	Very high disinfection efficiency. Adequate for all infectious ' waste and most pharmaceutical and chemical waste.	Incomplete destruction of cytotoxics. Relatively high investment and operating costs.
[3] SINGLE CHAMBER INCINERATION	Good disinfection efficiency. Drastic reduction of weight and volume of waste. The residues may be disposed off in landfills. No need for highly trained operators. Relatively low investment and operating costs.	Inefficiency in destroying thermally resistant chemicals and drugs such as cytotoxics.
[4] DRUM OR BRICK INCINERATION	Drastic reduction of weight and volume of the waste. Very low investment and operating costs.	Destroys only 99% of microorganisms.

[5] CHEMICAL DISINFECTION	1. Highly efficient disinfection under good operating conditions. 2. Some chemical disinfectants are relatively inexpensive.	1. Requires highly qualified technicians for operation of the process. 2. Uses hazardous substances that require comprehensive safety measures. 3. Inadequate for pharmaceutical, chemical and some types of infectious waste.
[6] WET THERMAL TREATMENT	1. Environmentally sound. 2. Relatively low investment and operating costs.	1. Shredders are subject to frequent breakdowns and poor functioning. 2. Operation requires qualified technicians. 3. Inadequate for anatomical, pharmaceutical, chemical waste and waste that is not readily steam-permeable.
[7] MICROWAVE IRRADIATION	Good disinfection efficiency under appropriate operating conditions.	Relatively high investment and operating costs
[8]INERTIZATION	Relatively inexpensive.	Not applicable to infectious waste.

BIO – MEDICAL WASTE IN INDIA

- Bio-Medical Waste (Management and Handling) Rule 1998, prescribed by the Ministry of Environment and Forests, Government of India, came into force on 28th July 1998. This rule applies to those who generate, collect, receive, store, dispose, treat or handle bio-medical waste in any manner. Table 4 shows the categories of bio-medical waste, types of waste and treatment and disposal options under Rule 1998. The bio-medical waste should be segregated into containers/bags at the point of generation of the waste.

CATEGORIES OF BIO – MEDICAL WASTE IN INDIA [SCHEDULE-1]

OPTION	WASTE CATEGORY	TREATMENT AND DISPOSAL
CATEGORY NO. 1	Human anatomical waste (human tissues, organs, body parts).	incineration / deep burial.
CATEGORY NO. 2	Animal waste (animal tissues, organs, body parts carcasses, bleeding parts, fluids, blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospital, animal house).	incineration / deep burial.
CATEGORY NO. 3	Microbiology and biotechnology waste (waste from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, waste from production of biologicals, toxins, dishes and devices and for transfer of cultures).	local autoclaving / microwaving / incineration.

CATEGORY NO. 4	Waste sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps).	disinfection (chemical treatment®/ autoclaving/ microwaving and mutilation shredding).
CATEGORY NO. 5	Discarded medicines and cytotoxic drugs (wastes comprising of outdated, contaminated and discarded medicines).	incineration® destruction and drugs disposal in secured landfills
CATEGORY NO. 6	Solid waste (Items contaminated with blood, and fluids including cotton, dressings, soiled plaster casts, linen, beddings, other material contaminated with blood).	incineration® autoclaving / microwaving.
CATEGORY NO. 7	Solid waste (wastes generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.).	disinfection by chemical treatment®® autoclaving/ microwaving and mutilation / shredding ##.

CATEGORY NO. 8	Liquid waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities).	disinfection by chemical treatment @@ and discharge into drains.
CATEGORY NO. 9	Incineration ash (ash from incineration of any bio-medical waste).	disposal in municipal landfill.
CATEGORY NO. 10	Chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.	chemical treatment®® and discharge into drains for liquids and secured landfill for solids.

COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIOMEDICAL WASTE [SCHEDULE – 2]

COLOUR CODING	TYPE OF CONTAINER	WASTE CATEGORY	TREATMENT OPTIONS AS PER SCHEDULE 1
YELLOW	PLASTIC BAG	CAT.1, CAT.2 AND CAT.3, CAT.6	Incineration/deep burial
RED	DISINFECTED CONTAINER/PLASTIC BAG	CAT.3, CAT.6, CAT.7	Autoclaving/Microwaving/ Chemical treatment
BLUE/WHITE TRANSLUCENT	PLASTIC BAG/PUNCTURE PROOF CONTAINER	CAT.4, CAT.7	Autoclaving/Microwaving/ Chemical treatment and Destruction/Shredding
BLACK	PLASTIC BAG	CAT.5 AND CAT 9 AND CAT.10 (SOLID)	Disposal in secured landfill

Industrial Waste Management

- Industrial waste disposal in the environment
- Reduction of hazardous gas emission
- Radioactive waste

Objectives

- state what industrial waste is?
- Explain ways to control industrial waste disposal
- Understand the importance of managing industrial waste

Industrial waste are manage in 2 main ways:

- **by managing & treating the waste**

- **by enforcing rules and regulations enacted for the purpose**

Source of Industrial Waste :

gas	Solid/liquid	Other
Exhaust gases from motor vehicles	Toxic compounds containing heavy metals	Organic waste
Toxic gases from factories	Pesticides and chemical fertilizers	Radioactive waste

Ways to control Industrial Waste

Exhaust gases from motorvehicles

- Catalytic converters should be fitted to the exhaust pipes to change the exhaust gases into harmless substances.
- Use unleaded petrol

- Reduce the sulphur content in petrol
- Ensure car engines are in proper working order(less smoke)

Toxic gases from factories

- Toxic gases should be treated before they released into the air.

Example:

Acidic gases should be neutralised

- Electrostatic precipitators can be fitted to the factory chimneys to attract large waste particles, such as carbon.

- Tall chimneys can be built to direct smoke high into the air, so that it can carried & dispersed by wind.

Toxic compounds containing heavy metals

- These substances must be treated & changed into harmless substances
- Example

  - harmful heavy metals should be extracted & recycled for use.

Pesticides and chemical fertilizers

- These should be controlled so that excessive amount are not used.

- Biological control should be encouraged.
  - using predators to control pests.
  - oil plantation use white owls to catch rats which feed on the oil palm fruit.



- **Farmers encouraged to use natural manure.**
  - **-cow dung**
  - **-compost**



Organic waste

- Organic waste can be treated in oxidation ponds where bacteria oxidise it into water, carbon dioxide and harmless residue. The residue may be turned into cattle feed / manure.
- Organic waste is decayed to produce biogas
- Small amounts of organic waste buried as biodegradable. Also burnt in properly built incinerators.

Radioactive waste

- Is dangerous & great care must be taken to ensure that it is safety disposal of.
- Placed in lead or concrete containers with thick walls.
  - It must thrown into deep sea or buried deep in the ground far away from residential areas.

Enforcing Rules & Regulations

- Control of industrial waste the responsibility of the Natural Resources and Environment Ministry.
- Local councils and municipalities help the ministry to ensure that rules and regulation are allowed.

- Anyone not following the rules and regulations may be arrested, fined and jailed.

Ways to manage industrial waste

managing and treating industrial waste by using modern techologies such as electrostatic converters

- Using alternative source such as unleaded petrol
- Treatment before disposal of waste materials
- Control the usage of pesticides and fertilizers
- Awareness and educational programme
- Law, regulation and enforcements

The Importance of managing industrial waste properly

- to ensure that industrial waste is properly managed so that the environment is free from pollution, clean and does not endanger the lives of people.

- **The people must co-operation and work together with the health authorities to bring about a clean and healthy environment**

Conclusion

We must handle industrial waster properly so that we can lead a healthy and happy life.

NUCLEAR WASTES AND ITS DISPOSAL

Q. WHAT IS NUCLEAR WASTE ?

- Nuclear wastes are wastes that contain radioactive material. Nuclear wastes are usually by-products of nuclear power generation and other applications of nuclear fission or nuclear technology.

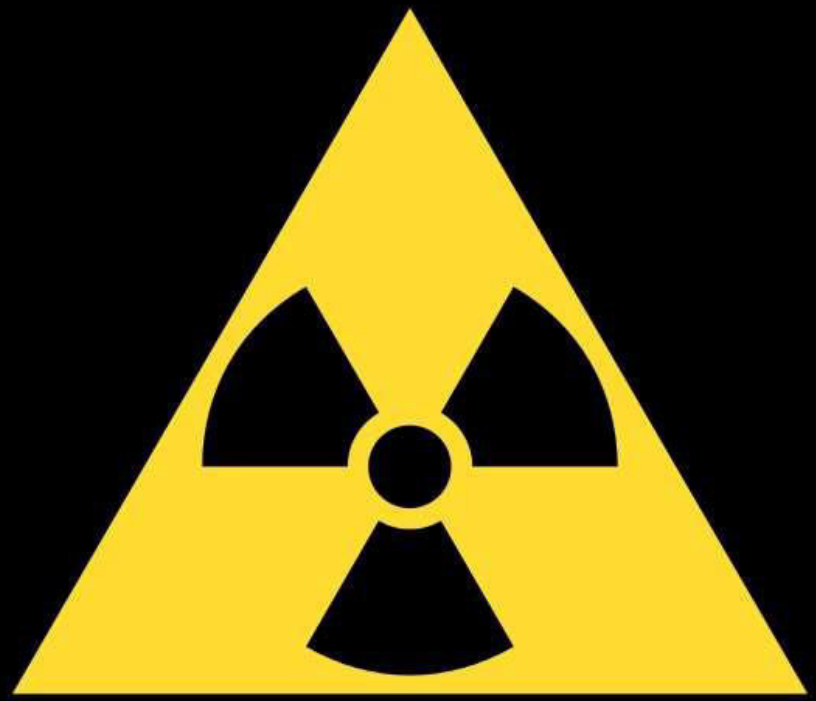
NUCLEAR WASTES CLASSIFICATION

- Nuclear wastes categories
  1. Solid wastes
  2. Liquid wastes
  3. Gaseous wastes

NUCLEAR WASTES CLASSIFICATION

- Classification on the basis of radioactivity

1. High level wastes
2. Medium level wastes
3. Low level wastes



Nuclear waste symbol

Ways for Disposal of Wastes

Liquid Waste - The disposal of liquid wastes is done in two ways:

1. ***Dilution*** **-** The liquid wastes are diluted with large quantities of water and then released into the ground. This method suffers from the drawback that there is a chance of contamination of underground water if the **dilution factor** is not adequate.

2.**Concentration to small volumes and storage** – When the dilution of radioactive liquid wastes is not desirable due to amount or nature of isotopes, the liquid wastes are concentrated to small volumes and stored in underground tanks. The tanks should be of assured long term strength and leakage of liquid from the tanks should not take place otherwise leakage of contents, from the tanks may lead to significant underground water contamination.

Gaseous Waste – Gaseous wastes can most easily results in atmospheric pollution. Gaseous wastes are generally diluted with air, passed through filters and then released to atmosphere through large chimneys.

Solid Wastes – Solid wastes consists of scrape material or discarded objects contaminated with radioactive matter. These wastes if combustible are burnt and the radioactive matter is mixed with concrete, drummed and shipped for burial. Non-combustible solid wastes, are always buried deep in the ground.

Disposal of low level wastes

- Low level radioactive waste consists of:
  - Contaminated solids
  - liquids
  - animal carcasses
  - small sealed sources
- Radioactive animal carcasses are either incinerated or buried onsite.
- The nuclear wastes is cast in cement in steel drum and are buried either or kept at the bed of oceans.
- 90% of wastes are of low level quality.

Disposal of medium level wastes

- Medium level waste requires shielding when being handled.
- 7% volume of wastes.
- Dependent on the amount of activity it can be buried in shallow repositories.
- These wastes are mainly contaminated with neutron activation product isotopes.

Disposal of high level wastes

- High level waste has a large amount of radioactive activity and is thermally hot.
- 3% volume of waste
- 95% of radioactivity
- Current levels of HLW are increasing about 12,000 metric tons per year.
- Most HLW consists of Pu-238, 239, 240, 241, 242, Np-237, U-236

Radioactive and E-Waste Management

RADIOACTIVE WASTE MANAGEMENT:

Radioactive wastes are produced in different forms: high, low level & also solid, liquid & gaseous with various half-lives.

Low level must be stored for several decades, while high level must be stored for thousands of years.

Most low level comes from nuclear power plants, hospital universities, industries and others.

RADIOACTIVE WASTE DISPOSAL:

Bury in deep underground

Favorable method by most countries

Reprocessed to remove very long active isotopes & then fused with glass or ceramic materials & buried in deep underground.

Dump into deep oceans

May leak & contaminates the oceans or may be moved by volcanic activity

Change it into harmless or less harmful isotopes

Not done because the costs are very high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ELECTRONIC WASTE MANAGEMENT

Electronic waste or "e-waste" is a term used to describe old, end-of-life electronic appliances & devices.

Examples of "e-waste" include: computers; fax machines and copiers; televisions ….etc.

Electronic waste often has hazardous or toxic components that can impact the environment once the materials end up in a landfill or if they are improperly managed and disposed. For example: Arsenic, Beryllium, Cadmium, Chlorofluorocarbon (CFC), Chromium, Lead, Mercury and many other toxic substances.

Sources of E-Waste:

Home:
- PC
- Television
- Radio
- Cell phones
- Washing machine
- Microwave oven
- CD player
- Fan
- Electric Iron
- etc

Hospitals:
- PC
- Monitors
- ECG device
- Microscope
- Incubator
- etc

Government:
- PC
- CPU
- FAX machine
- Xerox machine
- Scanner
- Fan
- Tube lights
- Air conditions
- etc

Private Sectors
(Restaurants , Industries)
- PC
- Boilers
- Mixer
- Signal Generators
- Incubator
- etc

MANAGEMENT METHODS:

Reduce:

- Choose long-lasting, durable products over disposable ones

Upgrade

- Rather than replace

Repair

- Rather than buy something new.

Re-use

- Give or sell your old technology & appliances to someone who needs it. Or find an organization that accepts unwanted computer equipment & refurbishes it for use by schools and charities

Recycle

- Stop solid & hazardous waste going to landfill, save resources which can be used to manufacture new products, and reduce the use of raw materials