UNIT 8: WASTE DISPOSAL & POLLUTION CONTROL

Introduction

- Pollution is the introduction of contaminants into the natural environment that cause adverse change, in the form of killing of life, toxicity of environment, damage to ecosystem and aesthetics of our surrounding.
- An unwanted change in the environment which involves the physical, biological and chemical changes involving air, water and land which affects the human life in one way or the other".
- Pollution has become a serious issue after World War II in developing countries due to unchecked rapid industrialization.
- Pollution is the root cause of many diseases that kill and disable living organisms.
- Contamination by Industries Pollution is everywhere.

Types of Pollution

- Air Pollution.
- Water Pollution.
- Noise Pollution.
- Littering (spilling of oils in oceans)
- Soil contamination (by lead, heavy metals)
- Radioactive contamination.
- Thermal pollution.
- Visual Pollution.

AIR POLLUTION

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.

Sources of Air Pollution

- Household combustion devices.
- Motor vehicles.
- Industrial facilities.
- Forest fires

Pollutants causing Air Pollution

- Include particulate matter. (Particulate matter is the sum of all solid and liquid particles suspended in air many of which are hazardous. This complex mixture includes both organic and inorganic particles, such as dust, pollen, soot, smoke, and liquid droplets.)
- Carbon monoxide.
- Nitrogen dioxide
- Sulphur dioxide

Harmful effects of Air Pollution

- Effects on cardiovascular health
- Effects on breathing (asthma).
- Links to cancer
- Effects on children

How to control air pollution?

- Maintaining a healthy distance between the industrial and residential areas.
- The chimneys should be constructed tall in size so that the emissions must be released higher up in the environment
- The sulphur must be removed after burning.
- The gasoline must have anti knocking agents.
- The mining area should be planted with trees.
- The coal fuel should be replaced with gas fuel to control the air pollution.
- The automobiles must be designed with emission control system.

- The wastes must be removed and recycled in the industrial plants and refineries.
- Plants like pine and ribes need to be planted to metabolize the nitrogen oxides and other pollutants.
- Timely servicing of the car helps to keep it in a good condition, and also minimizes fuel exhaustion
- Using public transportation helps to prevent the air pollution
- Using alternative energy sources like solar energy, hydroelectric energy, and wind energy

WATER POLLUTION

- Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater).
- Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds.
- Water pollution affects plants and organisms living in these bodies of water.
- In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities.

Polluted Water comes from

- Domestic sewage.
- Industrial wastewater.
- Agricultural wastewater.
- Construction site stormwater.
- Urban runoff (stormwater).
- Petroleum hydrocarbons
- Plastics
- Pesticides
- Heavy metals
- Sewage
- Radioactive waste
- Thermal effluents Water Pollutants…
- Detergents
- Chloroform

- Food processing waste, (fats and grease)
- Insecticides and herbicides.
- Petroleum hydrocarbons, (gasoline, diesel fuel, jet fuels, and fuel oil).
- Lubricants (motor oil).
- From stormwater runoff.

Preventing Water Pollution

- Conserve water by turning off the tap.
- Mind what you throw down your sink or toilet.
- Don’t throw paints and oils in water channels.
- Use environment friendly household products, such as washing powder, household cleaning agents etc.
- Take great care not to overuse pesticides and fertilizers.
- Don’t throw litter into rivers, lakes or oceans.
- Help clean up any litter you see on beaches or in rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.

Treating Polluted Water

- Suspended, solid particles and inorganic material can be removed by the use of filters.
- Use of biological filters and processes can naturally degrade the organic waste material.
- After above two steps chemical additives are supplied to get rid of any left-over impurities.

LIGHT POLLUTION

Light pollution, also known as photo pollution or luminous pollution, is excessive, misdirected, or obtrusive artificial light.

Light pollution Causes

- Degradation of photic habitat by artificial light.
- Artificial Lights Disrupt the World's Ecosystems.
- Nocturnal animals sleep during the day and are active at night.
- Light pollution radically alters their night-time environment by turning night into day.
- Artificial lights disrupt this nocturnal activity, interfering with reproduction and reducing populations.

Controlling Light Pollution

- Excessive lighting should be avoided.
- For Lighting an applicable design should be followed.
- Light engineering should be applied for streets.

NOISE POLLUTION

- Noise pollution is displeasing or excessive noise that may disrupt the activity or balance of human or animal life.
- Noise means disgust or discomfort hearing from environment.

Sources of Noise Pollution

- Machines.
- Transportation systems.
- Motor vehicles.
- Aircrafts.
- Trains.
- Poor urban planning.

Effects of Noise Pollution

- Noise pollution affects both health and behaviour.
- Unwanted sound (noise) can damage psychological health.
- Noise pollution can cause
- Annoyance
- Aggression
- Hypertension
- High stress levels
- Hearing loss.
- Sleep disturbances, and other harmful effects.
- Chronic exposure to noise may cause noise-induced hearing loss.
- Older males exposed to significant occupational noise demonstrate significantly reduced hearing sensitivity than their non-exposed peers.

SOIL POLLUTION

- Soil contamination or soil pollution is caused by the presence of xenobiotic (human-made) chemicals or other alteration in the natural soil environment.
- It is typically caused by industrial activity.
- Agricultural chemicals.
- Improper disposal of waste. Soil Contaminating Chemical
- Petroleum hydrocarbons.
- Poly nuclear aromatic hydrocarbons.
- Pesticides
- Lead and Other heavy metals.

How to control soil pollution?

- Limit the use of fertilizers and pesticides
- Awareness about biological control methods and their implementation
- The grazing must be controlled and forest management should be done properly
- The afforestation and reforestation must take place
- Proper preventive methods like shields should be used in areas of wind erosion and wind breaks

- Treating Wastes of industries.
- Treating nuclear waste.
- Proper disposing of plastics and other garbage materials.

Thermal Pollution

- Thermal pollution is the degradation of water quality by any process that changes ambient water temperature.
- A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers.
  When water used as a coolant is returned to the natural environment at a higher temperature, the sudden change in temperature decreases oxygen supply and affects ecosystem composition.
- Fish and other organisms adapted to particular temperature range can be killed by an abrupt change in water temperature (either a rapid increase or decrease) known as "thermal shock."

Solid waste and its management

Solid Waste

Solid waste is any non-liquid, non-soluble material ranging from municipal garbage to industrial wastes.

Solid waste includes

- Garbage
- Rubbish
- Demolition products
- Sewage treatment residue
- Dead animals
- Manure and other discarded material

Solid waste poses serious threat to the environment globally.

Types of Solid Waste

BIODEGRADABLE:

- Biodegradable wastes are such waste materials which are and can be degraded by natural factors like microbes (e.g. bacteria, fungi and few more), abiotic elements like temperature, UV, oxygen, etc.
- Some examples of such wastes are food materials, kitchen wastes and other natural wastes.
- Microorganisms and other abiotic factors together break down complex substances into simpler organic matters which eventually suspend and fade into soil.
- The whole process is natural which can be rapid or slow. Therefore, the environmental issues and risks caused by biodegradable wastes are low.

NON - BIODEGRADABLE:

- Unlike biodegradable wastes, non-biodegradable cannot be easily handled.
- Non-biodegradable wastes are those who cannot be decomposed or dissolved by natural agents.
- They remain on earth for thousands of years without any degradation. Hence the threat caused by them is also more critical.
- A notable example is the plastics which are a commonly used material in almost every field.
- To give these plastics a long-lasting effect, improved quality plastics are being put to use. This made them more temperature resistant and more durable even after use.
- Other examples are cans, metals, and chemicals for agricultural and industrial purposes. They are the main causes of air, water and soil pollution and diseases like cancer.

Solid Waste Management in Hotels and Restaurants

- Huge volume of solid waste is generated every day in a hotel. Many of them, particularly organic wastes, comes from kitchen and restaurant residues.

- Waste paper and other consumables from the other departments also form substantial amount of solid waste.
- They pose a huge environmental and sanitation problem if not collected and disposed properly.

Collection of hotel and restaurant waste

- Hoteliers may make their own arrangements for collection of waste individually by big hotels or through their own association for a cluster of hotels, particularly in tourist places.
- The MC may extend help in primary collection of solid waste on full cost recovery basis.
- Charges for the collection of hotel waste may depend upon the quantity of waste to be picked up from the hotels and restaurants and frequency of collection required.

If local authorities are not taking care of the collection and disposal of solid waste from hotels then the hotel has to make its own arrangements for such disposal. They may choose one or a combination of following methods for waste disposal.

- Incineration
- Pulverisation
- Mechanical Compost Plant
- Trenching
- Controlled tipping
- Disposal into sea.
- Filling of low-lying are or landfill.

Methods of Solid Waste Disposal

INCINERATION: It is a waste treatment process that involves the combustion of organic substances contained in waste material.

PULVERISATION: In this method, waste is simply pulverized into powder form without any chemical change. The powder thus formed may be used as manure or discharged through sewage line.

MECHANICAL COMPOST PLANT: A compost plant converts the garbage into manure, which is rich in nitrogen. This is the most hygienic method of waste disposal but only for organic wastes.

TRENCHIG: In this method, waste is dumped in a trench and buried under soil. The garbage is converted to compost.

CONTROLLED TIPPING: This method is employed where land is available for redevelopment. Waste is tipped from dumper into hollow spaces in the ground about 4 to 7 feet deep and then buried under ground.

DISPOSAL INTO SEA: This method is relevant and available only to hotels near a sea. This is quite cheap but in times the non-soluble garbage may come back to the shore and cause problems.

FILLING OF LOW-LYING AREAS: Waste is dumped into low-lying areas.

Pollution and the Hotel Industry

- Pollution of various forms is a cause of great concern for existence of life on the earth. One of the most disconcerting effects of pollution is global warming. Other direct effects include increasing health problems, mental stress and strain, increase in the number of endangered species, ecological imbalance among others.
- Hotels are properties where very high intensity of human and machine activities occur day in and day out. This is bound to produce all sorts of pollution and is subject to very stringent pollution control measures.
- In tourist destinations, there will be surface transport carrying guests to and from the hotels, thereby causing great pollution from automobile emission.
- Hotel Industry contributes to the following types of pollution:
- Water pollution
- Air pollution
- Soil pollution
- Noise pollution

Hotels and Water Pollution

- Rampant discharge of waste water and effluents into water bodies has played havoc with hygiene and ecology.
- Waste water disposal without proper treatment has severely affected marine life and living of downstream people using the water bodies for economic as well as day to day use of water.
- Discharge of hot water also produces pollution in changing the aquatic environment of water bodies.
- Hotels produce a lot of waste water and many of them have now installed their own STP, which contributes greatly in reducing pollution as well as gaining economy by way of reuse of clear water.
- This pollution can be minimized at the source by restricting chemicals that mix with water.

Hotels and Air Pollution

- Hotels liberate gases and contaminated air from various utilities, such as kitchen gas and firewood ovens, fume from materials being cooked, boiler and diesel generating set exhausts, and release of refrigerant CFC, if there is any leakage.
- If the boiler is fired with pulverized (powdered) coal, the exhaust gas will have a lot of dust particles leading to air pollution.
- Diesel engines also produce pollutants such as carbon dioxide, carbon mono oxide and oxides of nitrogen.

Hotels and Soil Pollution

- Hotels contribute to soil pollution by dumping their solid waste and sludge into the soil.
- Excessive dumping of untreated or semi treated sewage and sludge may lead to contamination of soil and also produce foul odour.

Hotels and Noise Pollution

Hotels have quite a few noise generating sources such as engines, pumps, motors etc. And sound produced in banquet halls.

Liquid Waste (Sewage) its treatment and disposal

- Hotels produce a lot of waste water and usually the waste water is disposed off in water bodies such as river, sea, lake or as landfill.
- But acc. to the norms of the PCB (Pollution Control Board) , sewage needs to be properly treated before it is disposed.

SEWAGE TREATMENT:

It is the process of removing the contaminants from sewage to convert it to a composition of clear liquid and solid, which are fit for discharge to the environment or for reuse.

SEWAGE TREATMENT PLANT

- In the most sophisticated treatment, clear potable water can be obtained while leaving only 5 per cent to 10 per cent of solids after treatment.
- This solid part, called sludge, is further processed to produce what is called biosolid, which have many uses.
- While hoteliers can discharge their sewage to the public sewerage, along with town sewage, for treatment in the city sewage treatment plant and final disposal.
- Many hotels have opted for in-house, Sewage Treatment Plants, where they get fresh water for reuse and may use the sludge as manure for garden activities.
- The fundamental principal of purifying sewage is to completely break down the original organic matter in it by the action of microorganisms (bacteria). These microorganisms digest (eat away) the original organic matter leaving a clear effluent and solids.

The stages in treatment of sewage are as follows:

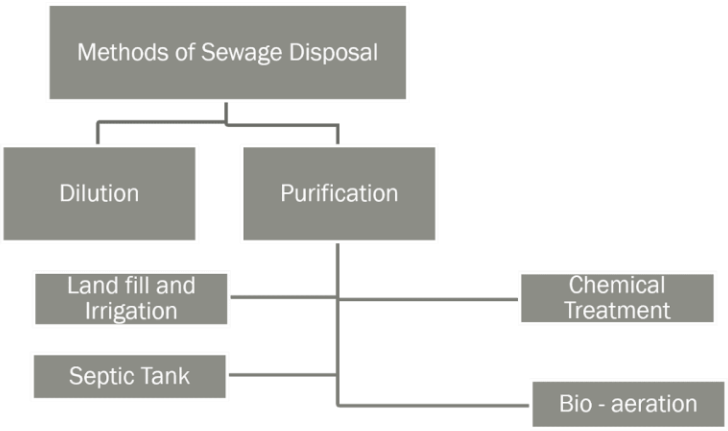
1. Primary Treatment: This removes the suspended and floating objects by means of strainer, screens, grit chamber, sedimentation tanks, septic tanks, etc. The typical materials that are removed in this stage include large objects such as sticks, rugs, rocks, sand, gravel, fats, oils, grease etc.

2. Secondary Treatment: This treatment is designed to degrade the biological and organic content of the sewage by means of microbial action. The bacteria present in the sewage consume all the organic matter.

3. Tertiary process with or without disinfectant: The final treatment is performed at this stage before making eventual disposal of the treated wastewater. Tertiary treatment comprises of many processes and includes filtration, disinfection and removal of nutrients such as nitrogen and phosphorus which encourage algae formation. Disinfection can be done with chlorine, ozone and ultraviolet treatment. In many cases, disinfection is done as the last activity (also called effluent polishing). The purpose of disinfection is to destroy residual bacteria in water after secondary treatment, thus rendering it very safe for final disposal.

Methods of Sewage Disposal

Sewage disposal is broadly classified into the following types:



Methods of Sewage Disposal

Dilution – Raw sewage or partly treated sewage is thrown into natural water bodies such as sea, river, lake, marshy land, etc. Self-purification is the mechanism in this process, which is helped by the following factors:

- Dilution of contaminants by dispersion in flowing water.
- Sedimentation of particles to the water bed.
- Oxidation of organic matter by dissolved oxygen in water.
- Sunlight, which kills harmful bacteria.
- Microbial organisms consuming the solid organic matter in sewage.

Purification – This process comprises of a change in the chemical and biochemical character of the sewage in a treatment plant and is affected through one or a combination of the following processes:

LAND FILL AND IRRIGATION:

Raw or partly treated sewage is dumped on land. A part evaporates, while a part percolate. Purification is accomplished by natural oxidation. This is a very good method of sewage disposal where land is available. Bright sunshine helps in microbial activities in the sewage. Decomposed sewage becomes an excellent manure for crops. However, if harmful bacteria percolate through ground subsoil reaching the ground water, it could contaminate ground water.

Chemical Treatment: Effected by addition of chemicals such as lime, alum etc.

Septic Tank – Used to provide disposal of sewage in a plain sedimentation tank where biochemical reactions (decomposition) also takes place. After decomposition sewage is purified and effluent is taken to soak pits for disposal to city sewers. The solid portion remains in the sceptic tank due to which the septic tank should be cleaned after a period of 5 to 10 years.

Bio-aeration – The sewage is first passed through coarse screens to get rid of large solids. The sewage is then treated in the main aeration tank with compressed air.

GREEN HOTELS

Green hotels are environmentally friendly properties that take the initiative and implement very important practices and programs to reduce energy, water, and waste.

Green Hotels are participating in recycling programs, linen changing programs, installing energy efficient lighting, and getting their message out to their guests and how they are doing their part in protecting the planet.

Ways to control pollution in hotels

1. Install Energy Saving Technologies

It has been estimated that 75% of hotels' environmental impacts can be directly related to excessive consumption—including energy consumption. Installing energy-efficient technologies such as appliances, lighting, and heating and cooling systems can make a difference for both the environment and your hotel's bottom line.

2. Embrace Recycling

Another huge impact the hospitality industry has on the environment is due to the amount of waste hotels create. It's time to embrace recycling, and we're not just talking about using cloth napkins instead of paper.

According to the Green Hotels Association, a hotel in Toronto is recycling stained tablecloths into napkins, chef's aprons, and neckties, while other hotels are making cloth laundry bags from retired sheets. These are the sort of initiatives that can make a long-term difference when put into practice.

3. Encourage Guests to be Green

Put cards in each room asking guests to turn out the lights when they leave, or reuse towels if possible. Make recycling bins readily available to guests and be sure that they are aware of your green programs. When guests see that your hotel is making an effort to help the environment, they will want to do their part as well.

For those hotels looking to do even more, consider loaning or renting bicycles to guests, or look into installing a bike-sharing station.

4. Start Composting

An increasing number of hotels are realizing the benefits of composting food waste rather than throwing it out. Not only is it a popular and well-known green initiative that will impress your guests, it can save your hotel money on landscaping since composted waste can be used as organic fertilizer.

5. Save Water

There are so many ways hotels can save water: Installing toilet tank fill diverters in older toilets can save about 3/4 of a gallon of water per flush. Transitioning to nearly waterless laundry machines can save 80% of hotel water usage. Making water stations available to guests can discourage the use of bottled water. Follow the examples from other hotels that have implemented water-saving initiatives.

6. Plant a Garden

If you're considering expanding your outdoor offerings for guests, consider adding a garden rather than simply extending your patio or pool area. The Green Hotels Association notes that one Pennsylvania property has a 400-foot garden and produces organically-grown vegetables for its restaurant.

Now you don't have to go that far, but even a small garden (perhaps even on the rooftop for those of you with city properties) can help counteract your hotel's carbon footprint. Raised beds can be installed almost anywhere, and placing benches—made from recycled materials—around a garden can make for a wonderful guest experience.

7. Support Local, Sustainable Businesses

Hotels can help reduce their environmental impact by making smart purchasing choices as well. A hotel can reduce waste generation by making an effort to only purchase environmentally-friendly products, and purchasing locally can also reduce the impact on the environment and benefit the community.

You may also want to consider promoting other environmentally-friendly businesses to guests, such as local farm-to-table restaurants.

8. Implement Alternative Energy Sources

A number of hotels have switched at least portions of their energy usage to alternative sources, with great results. The Willard Intercontinental in Washington D.C. is now running on 100% wind energy power, resulting in a 12% decline in energy consumption, according to the Green Hotels and Responsible Tourism Initiative. Other hotels, particularly those in warmer climates, are making use of solar energy for signage and water heating. And as the market for alternative energy increases, more solutions will arise.

9. Take Care of Your Linens

We already mentioned recycling linens as a way to limit waste, but what about extending the life of those linens in the first place? Using laundry processes that limit the wear and tear on your linens can keep replacement costs, and your hotel's environmental impact, down.