

ENVIRONMENTAL POLLUTION - CONTROL MEASURES

C. Fundamentals of prevention and control of air pollution:

As mentioned above, air pollutants can be gaseous or particulate matters. Different techniques for controlling these pollutants are discussed below:

a. Methods of controlling gaseous pollutants –

1. Combustion – This technique is used when the pollutants are in the form of organic gases or vapors. During flame combustion or catalytic process, these organic pollutants are converted into water vapor and relatively less harmful products, such as CO₂.

2. Absorption – In this technique, the gaseous effluents are passed through scrubbers or absorbers. These contain a suitable liquid absorbent, which removes or modifies one or more of the pollutants present in the gaseous effluents.

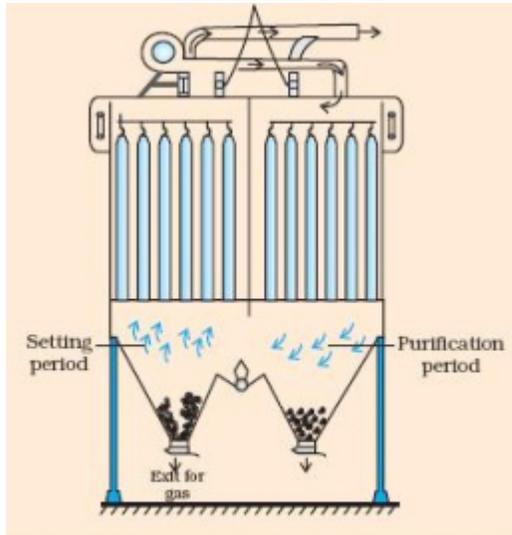
3. Adsorption – The gaseous effluents are passed through porous solid adsorbents kept in suitable containers. The organic and inorganic constituents of the effluent gases are trapped at the interface of the solid adsorbent by physical adsorbent.

b. Methods to control particulate emissions –

1. Mechanical devices generally work on the basis of the following: dustbagfilter

(i) Gravity: In this process, the particles settle down by gravitational force.

(ii) Sudden change in direction of the gas flow. This causes the particles to separate out due to greater momentum.



A typical bag filter

2. Fabric Filters: The gases containing dust are passed through a porous medium. These porous media may be woven or filled fabrics. The particles present in the gas are trapped and collected in the filters. The gases freed from the particles are discharged.

3. Wet Scrubbers: Wet scrubbers are used in chemical, mining and metallurgical industries to trap SO_2 , NH_3 , metal fumes, etc.

4. Electrostatic Precipitators: When a gas or an air stream containing aerosols in the form of dust, fumes or mist, is passed between two electrodes, then, the aerosol particles get precipitated on the electrode.
 dustelectrostaticprecipitator

c. Other practices in controlling air pollution - Apart from the above, following practices also help in controlling air pollution.

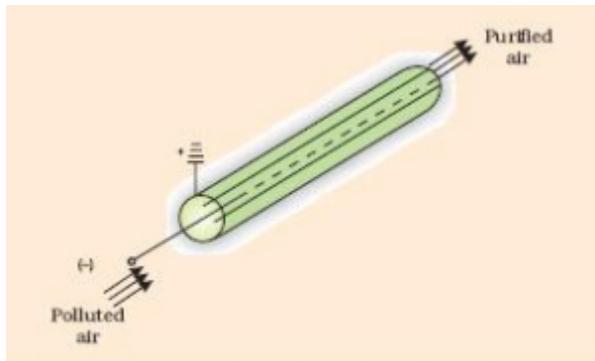
(i) Use of better designed equipment and smokeless fuels, hearths in industries and at home.

(ii) Automobiles should be properly maintained and adhere to recent emission-control standards.

(iii) More trees should be planted along road side and houses.

(iv) Renewable energy sources, such as wind, solar energy, ocean currents, should fulfill energy needs.

(v) Tall chimneys should be installed for vertical dispersion of pollutants.



Electrostatic precipitator

d. General air pollution control devices / equipments for industries – The commonly used equipments / process for control of dust in various industries are (a) Mechanical dust collectors in the form of dust cyclones; (b) Electrostatic precipitators – both dry and wet system; (c) particulate scrubbers; (d) Water sprayer at dust generation points; (e) proper ventilation system and (f) various monitoring devices to know the concentration of dust in general body of air.

The common equipments / process used for control of toxic / flue gases are the (a) process of desulphurisation; (b) process of denitrification; (c) Gas conditioning etc. and (d) various monitoring devices to know the efficacy of the systems used.

e. Steps, in general, to be taken for reduction of air pollution - To change our behavior in order to reduce AIR POLLUTION at home as well as on the road, few following small steps taken by us would lead to clean our Environment.

At Home:

1. Avoid using chemical pesticides or fertilizers in your yard and garden. Many fertilizers are a source of nitrous oxide, a greenhouse gas that contributes to global warming. Try organic products instead.

2. Compost your yard waste instead of burning it. Outdoor burning is not advisable, as it pollutes air. Breathing this smoke is bad for you, your family and your neighbors. Plus, you can use the compost in your garden.

3. If you use a wood stove or fireplace to heat your home, it would be better to consider switching to another form of heat which does not generate smoke. It is always better to use sweater or warm clothing than using fireplace.

4. Be energy efficient. Most traditional sources of energy burn fossil fuels, causing air pollution. Keep your home well-maintained with weather-stripping, storm windows, and insulation. Lowering your thermostat can also help – and for every two degrees Fahrenheit you lower it, you save about two percent on your heating bill.

5. Plant trees and encourage other to plant trees as well. Trees absorb and store carbon dioxide from the atmosphere, and filter out air pollution. During warmer days, trees provide cool air, unnecessary use of energy on air conditioning is avoided, hence the air pollution.

6. Try to stop smoking; at home, at office or at outside. Tobacco smoking not only deteriorates self's health, it affects others health too.

On the Road:

7. Keep your vehicle well maintained. A poorly maintained engine both creates more air pollution and uses more fuel. Replace oil and air filters regularly, and keep your tires properly inflated.

8. Drive less. Walking, bicycling, riding the bus, or working from home can save you money as well as reducing air pollution.

9. Don't idle your vehicle. If you stop for more than 30 seconds, except in traffic, turn off your engine.

10. Don't buy more car than you need. Four-wheel drive, all-wheel drive, engine size, vehicle weight, and tire size all affect the amount of fuel your vehicle uses. The more fuel it uses the more air pollution it causes.

D. Water pollution prevention and control:

Water is a key resource for our quality of life. It also provides natural habitats and eco-systems for plant and animal species. Access to clean water for drinking and sanitary purposes is a precondition for human health and well-being. Clean unpolluted water is essential for our ecosystems. Plants and animals in lakes, rivers and seas react to changes in their environment caused by changes in chemical water quality and physical disturbance of their habitat.

Water pollution is a human-induced change in the chemical, physical, biological, and radiological quality of water that is injurious to its existing, intended, or potential uses such as boating, waterskiing, swimming, the consumption of fish, and the health of aquatic organisms and ecosystems. Thus, the discharge of toxic chemicals from a pipe or the release of livestock waste into a nearby water body is considered pollution. The contamination of ground water, rivers, lakes, wetlands, estuaries, and oceans can threaten the health of humans and aquatic life.

Contaminants have a significant impact on aquatic ecosystems. For example, enrichment of water bodies with nutrients (principally nitrogen and phosphorus) can result in the growth of algae and other aquatic plants that shade or clog streams. Direct exposures to toxic chemicals such as pesticides, is also a health concern for individual aquatic plants and animals. Without healthy water for drinking, cooking, fishing, and farming, the human race would perish. Clean water is also necessary for recreational interests such as swimming, boating, and water skiing.

a. Sources of Water Pollution - Sources of water pollution are generally divided into two categories. The first is point-source pollution, in which contaminants are discharged from a discrete location. Sewage outfalls and oil spills are examples of point-source pollution. The second category is non-point-source or diffuse pollution, referring to all of the other discharges that deliver contaminants to water bodies.

Numerous manufacturing plants pour off undiluted corrosives, poisons, and other noxious byproducts to water streams. The construction industry discharges slurries of gypsum, cement, abrasives, metals, and poisonous solvents. The mining industry also presents persistent water pollution problems. In yet another instance of pollution, hot water discharged by factories and power plants causes so-called 'thermal pollution' by increasing water temperatures. Such increases change the level of oxygen dissolved in a body of water, thereby disrupting the water's ecological balance, killing off some plant and animal species while encouraging the overgrowth of others. Towns and municipalities are also major sources of water pollution.

In many public water systems, pollution exceeds safe levels. One reason for this is that much groundwater has been contaminated by wastes pumped underground for disposal or by seepage from surface water. When contamination reaches underground water tables, it is difficult to correct and spreads over wide areas. Discharge of untreated or only partially treated sewage into the waterways threatens the health of their own and neighboring populations as well. Along with domestic wastes, sewage carries industrial contaminants and a growing tonnage of paper and plastic refuse. Although thorough sewage treatment would destroy most disease-causing bacteria, the problem of the spread of viruses and viral illness remains. Additionally, most sewage treatment does not remove phosphorus compounds, contributed principally by detergents.

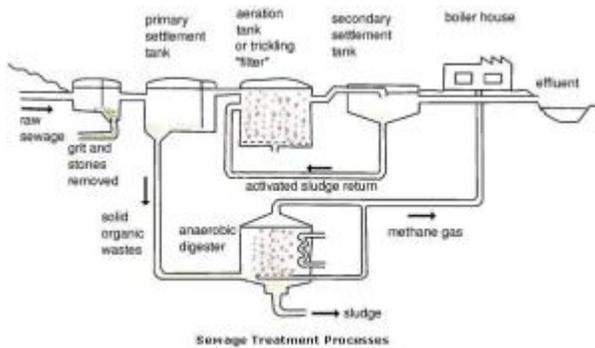
b. Dangers of Water Pollution - Virtually all water pollutants are hazardous to humans as well as lesser species; sodium is implicated in cardiovascular disease, nitrates in blood disorders. Mercury and lead can cause nervous disorders. Some contaminants are carcinogens. DDT is toxic to humans and can alter chromosomes. Along many shores, shellfish can no longer be taken because of contamination by DDT, sewage, or industrial wastes.

c. Prevention and Control of Water Pollution - Sewage should be treated before it is discharged into the river or ocean. This is possible through modern techniques. Groundwater-pollution

Sewage is first passed through a grinding mechanism. This is then passed through several settling chambers and neutralized with lime. Up to this stage, the process is called primary treatment. The sewage still contains a large number of pathogenic and non-pathogenic organisms, and also sufficient quantity of organic matter. The neutralized effluents are sent to UASB (up-flow anaerobic sludge blanket). It is a reactor. In this, the anaerobic bacteria degrade the biodegradable material present in the waste water. This removes foul odor and releases methane, which can be used elsewhere. In this system, the pollution load is reduced upto 85 percent. After this, water is sent to aeration tanks where it is mixed with air and bacteria. Bacteria digest the organic waste material. This is called biological or secondary treatment. Even after the treatment, water is not yet fit for drinking. The harmful microorganisms need to be killed. The final step (tertiary treatment) is, therefore, a disinfection process, to remove final traces of organics, bacteria, dissolved inorganic solids, etc. For tertiary treatment, methods, such as chlorination, evaporation, and exchange absorption may be employed. These depend upon the required quality of the final treatment. p_4



Apart from the above, you should also adopt the following practices:



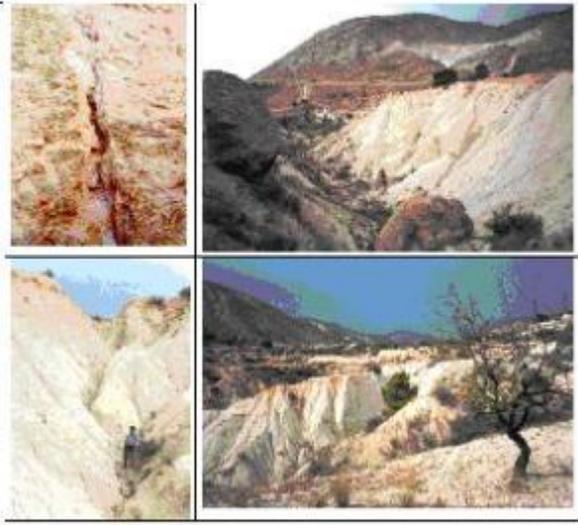
(i) Waste food material, paper, decaying vegetables and plastics should not be thrown into open drains.

(ii) Effluents from distilleries, and solid wastes containing organic matter should be sent to biogas plants for generation of energy.

(iii) Oil slicks should be skimmed off from the surface with suction device. Sawdust may be spread over oil slicks to absorb the oil components.

E. Soil erosion and its prevention: Soil erosion by water, wind and tillage affects both agriculture and the natural environment. Soil loss, and its associated impacts, is one of the most important (yet probably the least well-known) of today's environmental problems. It is mostly due to poor land use practices,

which include deforestation, overgrazing, unmanaged construction activity and road or trail building.



Soil is a complex mixture of living and non-living materials. It provides anchorage and sustenance to plants. Natural agents like water and wind, constantly tend to remove the top soil and cause erosion. Rain falling upon the unprotected top soil, washes it down into the streams. Due to the absence of plant covering, eroded soil cannot hold water. Water rushes into the rivers and overflows as flood. Dust storm also causes soil erosion. The particles of top soil are picked up in such quantities that they form clouds of dust. Human beings also cause soil erosion. The growing human habitation and expansion of urban areas lead to removal of vegetation. Once vegetation is removed, the naked soil gets exposed to wind and water. Improper tillage is another cause of soil erosion. Farmers often loosen the top soil for removing weeds and preparing seed beds. They also leave agricultural fields lying fallow for long time. These practices expose the top soil to the wind and cause erosion.

Soil erosion is always a result of mankind's unwise actions, such as overgrazing or unsuitable cultivation practices. These leave the land unprotected and vulnerable. Accelerated soil erosion by water or wind may affect both agricultural areas and the natural environment, and is one of the most widespread of today's environmental problems. Soil erosion is just one form of soil degradation. Other kinds of soil degradation include salinisation, nutrient loss, and compaction.

Prevention of soil erosion - Plants provide protective cover on the land and prevent soil erosion for the reasons:

(a) plants slow down water as it flows over the land (runoff) and this allows much of the rain to soak into the ground;

(b) plant roots hold the soil in position and prevent it from being washed away;

(c) plants break the impact of a raindrop before it hits the soil, thus reducing its ability to erode;

(d) plants in wetlands and on the banks of rivers are of particular importance as they slow down the flow of the water and their roots bind the soil, thus preventing erosion.

Preventing soil erosion requires technical changes to adopt. Aspects of technical changes include:

(i) use of contour ploughing and wind breaks;

(ii) leaving unploughed grass strips between ploughed land;

(iii) making sure that there are always plants growing on the soil, and that the soil is rich in humus (decaying plant and animal remains). This organic matter is the “glue” that binds the soil particles together and plays an important part in preventing erosion;

(iv) avoiding overgrazing and the over-use of crop lands;

(v) allowing indigenous plants to grow along the river banks instead of ploughing and planting crops right up to the water’s edge;

(vi) encouraging biological diversity by planting several different types of plants together;

(vii) conservation of wetlands.

We can check soil erosion by adopting the following additional practices:

1. Intensive cropping and use of proper drainage canals.

2. Terracing on the sloping fields. This retards the speed of the flowing water.

3. Planting trees and sowing grasses.

4. Extensive afforestation practices to be carried out.

[For more refer Soil Erosion Combating is Essential]

F. Mitigation of Noise pollution: Reducing noise pollution by muffling the sounds at the source is one of the best methods in industry and for urban living. Protective equipment is generally mandatory when noise levels exceed 85 dB(A) in industry. Creation of green cover adjacent to municipal roads and in mines is the way to mitigate noise pollution. It has been observed that noise level reduces by 10 decibels per every 10m wide green belt development. Apart, redesigning industrial equipment, shock mounting assemblies and physical barriers in the workplace are also for reduction and exposure of unwanted industrial noise.

High way noise pollution can be mitigated by constructing noise barriers. Artificial noise barriers are solid obstructions built between the highway and the residential areas along a highway. They block major portion of noise produced by passing vehicles on a highway. Effective noise barriers typically reduce noise levels by as much as half or more. The construction of noise barrier may be built in the form of earth mounds, vertical wall along the highways for creation of blockage of sound generated by heavy vehicles. Creation of greenbelt in the space between the residences and highways also reduces the noise nuisance.

G. Conservation and protection of environment: By now, all of us have realized how important it is to protect the environment for our own survival. The term 'conservation' of environment relates to activities which can provide individual or commercial benefits, but at the same time, prevent excessive use leading to environmental damage. Conservation may be distinguished from preservation, which is considered to be "maintaining of nature as it is, or might have been before the intervention of either human beings or natural forces." We know that natural resources are getting depleted and environmental problems are increasing. It is, therefore, necessary to conserve and protect our environment. Following practices help in protecting our environment.

1. Rotation of crops.

2. Judicious use of fertilisers, intensive cropping, proper drainage and irrigation.
3. Treatment of sewage, so that it does not pollute the rivers and other water bodies.
4. Composting organic solid waste for use as manure.
5. Planting trees in place of those removed for various purposes.
6. National parks and conservation forests should be established by the government.
7. Harvesting of rain water.

Some action points to protect or improve the environment -

- (i) Dispose the waste after separating them into biodegradable and non-biodegradable waste material.
- (ii) Start a compost heap or use a compost bin. This can be used to recycle waste food and other biodegradable materials.
- (iii) Avoid unnecessary or wasteful packaging of products.
- (iv) Reuse carry bags.
- (v) Plant trees. They will help to absorb excess carbon dioxide.
- (vi) Observe World Environment Day on 5th June.

(vii) Never put any left over chemicals, used oils down the drain, toilet or dump them on the ground or in water or burn them in the garden. If you do so, it will cause pollution.

(viii) Don't burn any waste, especially plastics, for the smoke may contain polluting gases.

(ix) Use unleaded petrol and alternate sources of energy, and keep the engine properly tuned and serviced and the tyres inflated to the right pressure, so that vehicle runs efficiently.

(x) Avoid fast starts and sudden braking of automobiles.

(xi) Walk or cycle where it is safe to do so – walking is free; cycling can help to keep you fit.

(xii) Use public transport wherever you can, or form a car pool for everyday travel.

(xiii) Send your waste oil, old batteries and used tyres to a garage for recycling or safe disposal; all these can cause serious pollution.

Source : <http://saferenvironment.wordpress.com/2009/09/01/environmental-pollution-problems-and-control-measures-%E2%80%93-overview/>