

CLEANER TECHNOLOGIES

Industrial revolution resulted in the production of a large number of goods and services for the convenience of people. Life became much easier and comfortable. But large scale industrial production resulted in accumulation of huge amounts of wastes, which in turn created pollution of air, water, land and adversely affected plant and animal life. The environment of earth is loaded with wastes much beyond its carrying capacity. The volume of waste and out of service goods and gadgets over loaded and pollution must be controlled in order to provide a healthy environment for man and other animals.

Now there is growing context to apply scientific knowledge and methods to develop “cleaner technologies” so that the natural resources and energy are used efficiently and in such a way waste generation can be minimized that the environment is protected from harmful effects of resulting pollution. Industries are engaged in evolving cleaner technology or eco-friendly technology based on improved manufacturing methods that require less raw materials and energy to produce more and even better quality goods and services. Cleaner technology use raw material efficiently and reduce the quality and quantity of waste itself.

OBJECTIVES

After completing this lesson, you will be able to:

- define waste and describe the methods for reducing, recycling and reusing waste;
- explain type of waste found in the surroundings;
- define waste management;
- explain the methods of safe disposal of nuclear wastes;
- cite examples of nuclear hazards and identify their causes, prevention and control;
- explain the concept of cleaner technologies;
- describe the concept of life cycle analysis;
- explain the concept of eco-mark.

22.1 TYPES OF WASTES

Waste is an unwanted or discarded material that can not be used in its present form. Waste can be classified into the following categories:

(1) Industrial solid waste The major producers of solid waste are:

- Thermal power plants producing coal ash/ fly ash;
- The integrated iron and steel mills producing blast furnace slag;
- Non-ferrous industries

like aluminium, copper and zinc producing red mud and tailings; • Sugar industries generating press mud; • Pulp and paper industries producing lime mud; • Fertilizer and allied industries producing gypsum; • Hospitals producing bio-medical waste.

(2) The major producers of liquid effluents 1. Cement 10. Pulp and Paper 2. Thermal power plants 11. Pharmaceuticals 3. Iron and steel 12- Dyes and dye intermediates 4. Fertilizer 13. Pesticides 5. Zinc smelters 14. Petrochemicals 6. Copper smelters 15. Tanneries 7. Aluminium smelters 16. Sugar and 8. Oil refineries 17. Basic drugs 9. Distilleries

(3) Municipal solid waste V egetable rejects from domestic units and vegetable markets, plastic material, building debris ,bio-medical waste etc.

(4) Industrial liquid waste There is hardly an industrial process that does not generate liquid effluents. Often these are discharged into the rivers or streams without any treatment. As a result, these effluents pollute river that adversely affects aquatic life and the river ecology . The industrial waste waters often contain valuable materials that can be recovered. This approach improves quality of effluent discharged into the river on one hand fetches additional income to the industry on the other hand. As an example, the recoverable material from industrial waste waters of different industries are given below:

Industry	Recoverable matter
Pulp and paper	Ligno-sulphate, sodium salts
T extile	Caustic soda
Distillery	Potassium salts, yeast
Fertilizer (phosphatic)	Calcium sulphate, fluoride
Coke oven	Ammonia, ammonium sulphate, tar , naphthalene, phenol

(5) Municipal liquid waste Sewage from hotels and residential colonies.

(6) Gaseous waste V arious gases are emitted from industrial installations that have potential use but are not being utilized. For example, Oil and Natural Gas Commission (ONGC) is flaring gas worth Rs 750 crores per annum. This can be converted into methanol and petrol. Carbon dioxide emitted from various sources can be used to produce calcium carbonate. Sulphur dioxide emitted can be converted into either elemental sulphur or gypsum. Waste heat from hot gaseous emissions can be recovered for suitable use.

(7) Radio-active waste Most of such waste is generated from nuclear power plants. The waste is highly hazardous to living animals and hence needs careful planning for its disposal and treatment. Wastes are divided into the following two categories according to their hazard potential: (i) Hazardous waste: These belong to a special category of wastes containing certain chemicals, metals, and pathogenic organisms that can cause serious health problems and damage to the environment even at low concentration. Indiscriminate disposal of these wastes into environment without proper treatment could lead to complex hazardous pollution of river water, land and ground water resources. (ii) Non-hazardous waste: All other wastes which are not covered under the hazardous category are included in this group.

22.2 concept of cleaner technologies

Generation of enormous amounts of wastes has caused alarming situation threatening human wellbeing. Cleaner technology is using technology in industries in such a way that environment is protected from harmful effects of waste accumulation and the resulting pollution. This led environmentalists, scientists and technologists to think seriously about cleaning the environment by reducing industrial and other types of wastes. The aim is to make industrial manufacturing processes cleaner and more sustainable by redesigning them taking clues from nature, that is, how nature deals with wastes. In nature, waste or the left over of one organism becomes food of another organism, so that nutrients of the earth are endlessly recycled.

- One way to emulate nature is to recycle and reuse the chemicals used in industries instead of dumping them into the environment.
- Industries may interact in such a way that they establish a “resource exchange” programme in which waste of one industry or manufacturer is utilized as raw material by another industry- similar to food web in nature.
- Use of CNG by automobiles instead of petrol, as an automobile fuel, is an example of cleaner technology which has reduced pollution of the environment.
- Instead of throw away economy which creates huge amount of waste, the manufacturers can make more money if their product is redesigned so that it uses minimum amount of raw materials lasts longer, easy to maintain, repair, remanufacture, reuse or recycle e.g. ‘Carrier’ a leading manufacturer of air-conditioning equipments are very efficient, easy to repair, remanufacture and recycle.

- Detoxifying hazardous wastes by chemical and biological methods to reduce their toxicity .
- Bioremediation is the process in which a living organism (plant/animal/bacteria) is deployed to make a hazardous wastes harmless. For example bacteria and enzymes help to destroy toxic and hazardous substances or convert them in harmless compounds. V arious plants have been identified which can help to clean up soil and water contaminated with chemicals such as pesticides, organic solvents, radioactive matter and toxic metals such as lead, mercury and arsenic.

The concept of cleaner technology is being practiced in different parts of the world under various names such as low and non-waste technologies, environmentally sound technologies, waste recycling, residue utilization and resource recovery technologies. However ultimate cleaner technologies will be based on renewable resources as raw material and energy and transformation through highly efficient biotechnologies to produce environmentally harmless products.

First Priority Second priority Last Priority Waste Prevention Reuse and Recycle Waste management

- Change in manufacturing process to stop production of harmful chemicals.
- Useless of harmful resources or materials
- Reduce packaging materials in products
- Make products that last longer and are easy to repair.
- Reuse products • Repair products • Recycle
- Compost (biodegradable)

- Reassembled/recyclable products

- Treat waste material to reduce toxicity
- Bury waste in land fills.
- Incinerate waste
- Release waste into the environment for dispersal and dilution.

Source : <http://nagahistory.wordpress.com/2014/04/07/sustainable-development-cleaner-technologies/>