

METHODS FOR REDUCING , RECYCLING AND REUSE OF WASTES

(a) Reducing Reducing consumption and redesigning the product (s) are the best ways to cut waste production.

Some of the ways to reduce resource use are:

- consume less, do not buy unless you absolutely need it.
- redesign manufacturing processes and products to use less material and energy . Example- Fuel efficient cars which will give more milage using fuel.
- redesign manufacturing processes to minimise waste for examples –use of hydrogen peroxide instead of toxic chlorine to bleach paper in the manufacturing process reduces.
- develop products that are easy to repair, reuse,recycle.
- design products which last longer like car tiers which runs for longer distances before they get damaged.
- reduce or get rid of unnecessary packaging or use reusable packaging and recyclable packaging.

(b) Reuse Reuse of products is an important way to reduce resource use, reduce pollution and waste. Reuse means cleaning and using the materials over and over, thereby extending the life span of the products.

- This form of waste reduction reduces the use of material and energy resources, cuts pollution and waste, creates local jobs and saves money , for example recovering automobile parts from old cars in junkyards, recovering and collecting bricks, doors, fine wood works and steel from old houses and reusing them for new constructions.
- In India we had a tradition of using cloths napkins, glass and metal utensils but gradually throw away tissues are substituted for reusable handkerchiefs, disposable paper towels and napkins for reusable cloth ones; throw away paper plates, cups and plastic ones for reusable plates, cups and metal utensils. We are using lot of aluminium foil and plastic bags. We must get back to our good old habit of using more of cotton, jute and metals in our daily life. This will surely reduce the load of garbage.
- While reusing the products, care must be taken to protect the health of people dealing with such objects. For example discarded TV sets, computers and cell phones are dismantled to recover usable parts and in the process one can get exposed to toxic metals like mercury , cadmium and lead. The remaining scrap is dumped in open fields or burned in the open which exposes the workers to toxic fumes of dioxins.

(c) Recycling Recycling is an important way to collect waste material and turn them into useful products that can be sold and used again.

- Recycling involves reprocessing of discarded materials into new useful products. Some common examples are recycled paper products (newspapers, magazines, office and school papers, cardboards), glass, aluminum, steel and some types of plastics.

- Biodegradable organic wastes (kitchen and other biological wastes) can be decomposed by microorganisms and worms and converted into composts which are returned to the soil as manure.
- Primary recycling occurs when waste is recycled into new products of the same type like turning old newspaper into new newspaper material, used aluminum cans into new aluminum cans, waste plastic bags into useful waste collection plastic bags.
- Secondary recycling occurs when waste materials are converted into different products. For example used automobile tyres can be shredded and turned into material to be used as rubberized road surfacing and newspaper can be turned into cellulose insulation, short fibres from paper pulp industry can be converted into paper boards.

NUCLEAR HAZARDS, THEIR CAUSES, PREVENTION AND CONTROL

Before discussing nuclear hazards, must know about radiation and radioactive materials. Radiation is a form of energy which is produced when the nucleus of an atom is broken apart called fission producing heat and radiation. Nuclear power plants use this heat to turn water into steam. Steam turns the turbine to produce electricity. Any radiation and any radioactive materials produced during the fission process are considered as waste products. Radiation emitted natural sources is known as “background radiation”, because it is present everywhere, all the time. Radioactive atoms are known as “radionuclides”. Water acts as a natural barrier to radiation and can be used to isolate radioactive spent nuclear fuel at nuclear power plants.

Nuclear “fuel cycle” begins with

- Mining of uranium ore from the underground mines.
- The ore is then crushed (milled) into sand and then concentrated using a solvent to produce “yellow cake”.
- It is then sent to a factory where it is turned into fuel “pellets” which are packed into rods.
- The rods are inserted in the core of a reactor, which undergoes nuclear reaction under controlled conditions to avoid explosion.
- The reaction (fission) produces tremendous heat, which boils water to make steam, the steam turns a turbine to produce electricity.

Each step of the ‘fuel cycle’, (mining, processing, transportation, nuclear power and energy production) poses a potential threat or hazard which is dangerous for life on earth. Apart from heat, many new radioactive elements (Strontium-90 and Plutonium-239) are also produced. These are unwanted and dangerous by products or “radioactive waste”. Uranium ore and mill waste remain heaped in deserts

because there is no place to store them. They blow around with wind and wash with rain giving out radioactive gas for thousands of years in future.

People are concerned about the safety of nuclear power plants that are currently operating. Radiations can be released from them and nuclear contamination can occur at other points Mining Processing Transportation Nuclear Power Energy Waste Decommissioning Hazards Uranium ore

in the nuclear fuel cycle. The recent accidents have had a great effect on people's attitudes towards power plants safety .

1. Three Mile Island (USA) 1979 2. Chernobyl (Ukrain) 1986 1. Three Mile Island (USA) 1979

Three Mile Island disaster occurred on 14th March, 1979. There was a breakdown of the main pump. The other auxiliary pumps failed to operate and electricity generating turbine stopped. At this point of time emergency coolant should have flooded the reactor to bring down the temperature. The coolant did start to flow but did not cooled the reactor but the faulty meter showed it otherwise. The high temperature resulted in core melt down and radioactive steam was thrown into the atmosphere. This was a nuclear disaster . Pregnant women and children were removed from the accident site. It was over a year before anyone could enter the plant. The damaged reactor was eventually defuelled in 1990 and the situation will be monitored till 2010.

2. Chernobyl (Ukrain) 1986 Chernobyl (Ukrain) on 25 April 1986 a test was being conducted to measure the amount of electricity that would be produced even if the steam was shut off but the turbine would still be spinning. To reduce the output of steam, control rods were lowered into the core. To prevent further delay in testing, the cooling system was manually turned off. This was a serious safety violation. As the test or the experiment continued the energy level of the reactor increased two thousand times, the fuel rods broke and the cooling water turned into steam.

There was a huge explosion and the roof of the reactor ripped off the concrete roof of the reactor . Radioactive fumes spread around and this became the world's worst nuclear accident. People suffered radiation sickness and this increased their chances to suffer from leukemia (blood cancer). Chernobyl put 300-400 million people at risk in fifteen countries. There is an increasing concern about the safety of nuclear reactors and there is an urgent need to develop ways and means to make nuclear generation safe and as a viable source of clean energy .

Prevention and control At both Chernobyl and Three Mile Island, it was operators error by the (human error) that caused the disastrous accident when operators manually stopped normal safety actions from taking place. Mechanical designing of the reactor should be such that the reactors should get shut down immediately under such conditions.

Many new designs do have such shut down mechanism to prevent such disasters. Huge amount of heat is generated in nuclear power plants, only one third of the heat is used in generating electricity and two third is lost as waste heat. To reduce the harmful effect of the waste heat, costly cooling facilities are constructed and operated. Nuclear power plants are often constructed close to a large water source like lakes, rivers, oceans from where large quantities of water can be drawn directly and returned after cooling process is over .

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