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Waste Management: A Review

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Abstract: The problems of waste generation and management have become a serious issue of concern to many countries. Although some countries are working in the direction of reducing it to the maximum. Examination of waste disposal and management should be administered by the key personnel to address such kinds of problem existed in the society. The Information such as the various classes of waste, frequency of waste disposal and methods of waste evacuation should be known to all so that they will find themselves in the state of managing such kind of activities which is called as waste management. The research and surveys conducted across the world clearly indicating that waste management practices adopted by any country needs to be upgraded and provide the result oriented output. Influential factor which may boost reduction waste generation could be the commitment towards providing a waste free environment. Besides, environmental enlightenment, industrial operation cannot be overlooked in this context. This aspect will enforce us to think about people's attitude towards waste generation and management in this specific area. At present time, waste management is requiring a holistic approach which will integrate all the technical, economic, social, cultural, and psychological factors that are often ignored in waste management programs.

Keyword: Waste Management, Waste Disposal Method, Waste Related Hazard and their control measure, 5R's

1. Introduction

At present, **"Waste Management"** is not a new word for anyone who is living in the 21st century. It is because of the fact that with the growth of industrial sectors and development in the technologies, an inevitable harassment of the environment is done by all of us. This could be converted into the ambience of environment if everyone on this earth thinks about the preservation of the environment from waste management point of view. In India, such kind of activity is generally governed by the government and other legislative parties like municipal committee but not effective to the extent which it has to be. So, it is crucial to think about it and take some step to manage it soundly.

Need of Waste Management: There is a need for a complete rethinking of "waste" - to analyses if waste is indeed waste.

A holistic approach is needed to manage the waste with the use of technology and analysis of waste. For example waste could be act as the source of income if mould into other valuable items and nowadays such kind of items are finding their values in the national as well as in international market significantly.

A clear approach dealing in recycling that involves public-private partnerships, aiming for eventual waste minimization - driven at all level, and using low energy/low technology resources is needed and should be adopted by all the technocrats to manage the waste. Some of the defining criteria for future waste minimization programs will include deeper community participation, understanding economic benefits/recovery of waste, focusing on life cycles (rather than end-of-pipe solutions), decentralized management of waste.

2. **Types of waste generated:** There are so many categories available but major categories in which waste can be broadly classified may be given as follows:

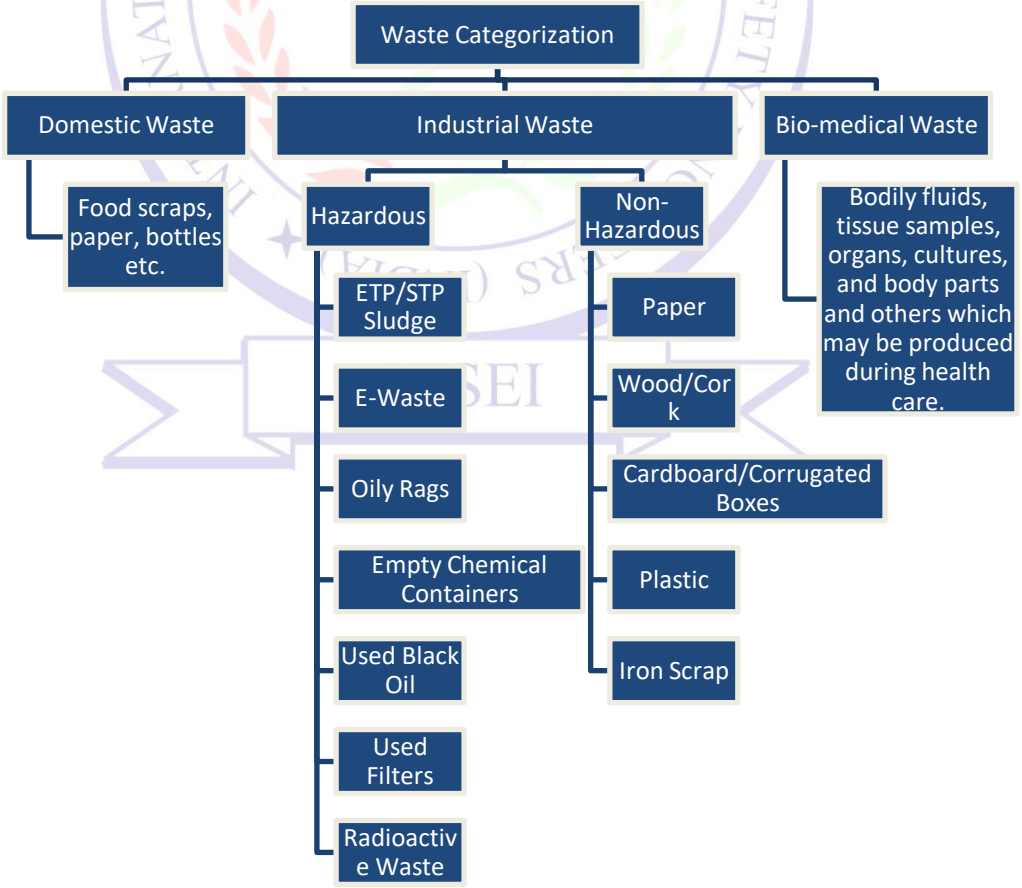

Fig. 1, Waste Categorisation

3. **Hazard associated with the waste:** Hazard may be defined as the situation or the thing which has the potential to cause harm is known as the hazard.

Hazards broadly classified into four main categories as per following chart:

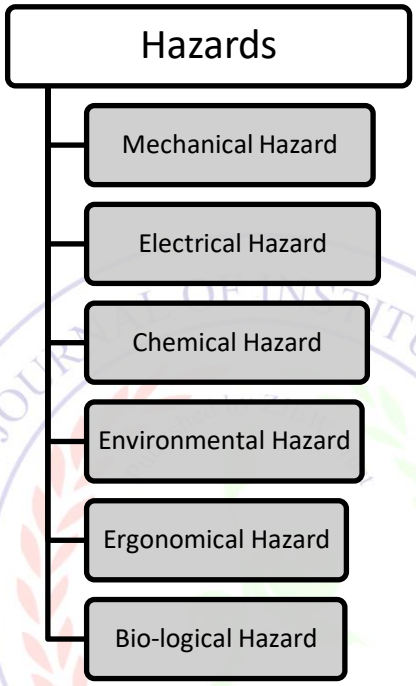

Fig. 2, Hazard Classification

- **Mechanical Hazard:** Mechanical hazard associated with the waste management may be defined as the cut, abrasion or bruise formation on the body while handling the sharp edge materials like metal scrap. Mechanical hazard sometime result in the critical injury while handling different kind of waste related to metal and others. Immediate care must be provided upon happening of any accident related to mechanical. Personal protection must be taken in due consideration of safety like gloves, goggles and helmet.
- **Electrical Hazard:** Electrical hazard may be defined as the hazard which may pose the risk to the person by electrocution or shock while disposing of the electrical waste. It may be due to charge stored in the discarded items which is sometime also known as the static charge or may be due to charged batteries which are not discharged fully before disposing. Electrical hazards sometime become disastrous for the waste handler if not properly handled. Due to such kind of hazard present in the electrical waste, care must be taken. Personal protection should never be overlooked while handling such kind of waste by wearing face shield, electrical resistant gloves, shock proof covering and safety shoes.

- **Chemical Hazard:** Chemical hazard may be defined as the presence of chemical in the discarded container which may attack on the body and harm the person who is handling the same. Critical care must be taken while handling such kind of waste and ensure that all the discarded or waste containers are free from the residue. Along with it, personal protection must be worn while handling such kind of waste like gloves, goggles, apron, gumboots, respirator and others as applicable.

  In identifying the health impacts of chemical and biological agents, the possible obstructing factors include the following: the long period before the effect becomes manifested, the multiplicity of causes of diseases (which makes it difficult to distinguish occupational diseases from diseases caused by, e.g., unhygienic living conditions); the lack of knowledge mechanisms involved in the pathogenesis of human chronic diseases; and a wrong classification of diseases. Chemicals that pose risks include chlorine, fluorine, paper bleaching, deinking, pulping agents, plastic additives and equipment cleaning solvents, and insecticides and herbicides. Contact with skin or inhalation or even ingestion of these chemicals can cause dermatitis, disorder to the central nervous system, and possible liver and kidney damage. Excessive heat generated from the metal melted may produced the dangerous gases which can cause the ill health condition. Exposure to chemicals can also cause irritation to the skin and respiratory tract and potential damage to the liver and central nervous system. Inhalation of metal, glass, paper, or plastic dust from shredding, damaging, and detaining can cause or aggravate chest discomfort, bronchitis, or asthma. Respiratory tract may get damage or fail to operate while working in the chemical prone area. Chronic exposure to some heavy metals may cause cancer and adverse effects to the central nervous gastrointestinal system. Disposal of old batteries and electronic and electrical appliances such as cell phones, radios, computers, televisions, digital satellite decoders, and fluorescent tubes may pose danger as these contain toxic substances such as mercury, lead, and cadmium.
- **Environmental Hazard:** Environmental hazards may be defined as the release of unwanted chemicals or other material in the environment and has direct or indirect effect on the environment. It may be consider as the accidental release of the chemical or used black oil from the discarded containers while disposing. Special care must be taken to avoid such kind of hazards. Usage of personal protective equipment is highly

recommended while handling such kind of waste and spill response material must be available in the vicinity of storage of such kind of waste.

- **Ergonomic Hazard:** Ergonomic hazards in the informal enterprises result from carrying or lifting heavy loads, repetitive movement and work, that is, shoveling, muscular-skeletal disorders resulting from handling heavy containers, heat stress resulting from exposure to excessive temperatures, and hearing loss due to too much exposure to excessive noise. Development of fatigue due to repetitive and cumbersome job like pick and keep down of the material continuously also consider as the source of development of musculoskeletal diseases i.e. MSD. Waste collection workers must lift, twist, and dump heavy bins and bags and during curbside sorting the lifting can exceed guidelines recommended and hence is likely to cause harm.

  Manual sorting tasks often require reaching, lifting, and twisting and this can cause workers pain, soreness, general fatigue, tendonitis, and musculoskeletal injuries of the feet, arms, shoulders, hands, wrists, and lower and upper back. The factors contributing the ergonomic hazards are mainly considered as the way of doing things, sitting gesture, movement of arm or wrist and stress taken.

  Bio-logical Hazard: Biological hazards associated with waste generated and disposed of in the informal sector enterprises include water borne diseases resulting from flies and mosquitoes breeding in dumping sites around the enterprises. Various infections transmitted by insects while handling the different kind of waste generated and collected. Disease like diarrhea is also cause by the contaminated water in the various form viz. stagnation into small pools. Workers may be infected by biological agents such as bacteria and viruses that contaminate waste, which are usually formed from the decomposition of matter and result in infections. Cuts or puncture wounds from broken glass, metal edges, or needles become the site of infection following exposure to bacteria and viruses and the infections include hepatitis B, fungi, or parasites. Common health problems associated with exposure to certain bacteria, fungi, and viruses include contact dermatitis infections, diarrhea, and skin diseases. Long-term occupational exposure to contaminated air in composting operations can include allergic responses such as asthma, chronic bronchitis, and hay fever. There is some others ill effect of waste on the health of worker which contribute in the deterioration of their health. Workers in paper sorting

operations have the highest incidence or chances of lung infections compared to all other waste workers and this is a result of high levels of organic dust and end toxins (poisonous substances produced by bacteria in the air). Contaminated and polluted and stagnated water is also responsible for developing so many disease like malaria and dengue among the waste handlers. Dermal and blood infections from direct contact with waste and from infected wounds, zoonosis resulting from bites by stray animals feeding on waste, and enteric infections transmitted by insects are the other biological hazards.

4. Hierarchy of control in the waste management

a. **Elimination:** Elimination is the best possible solution if feasible in terms of the generation of the waste. Always try to eliminate the waste as much as possible because this will reduce the headache of managing it.

b. **Substitution:** Substitution means the adoption of the technology which may produce the less waste. This will help us to manage it properly with less difficulty.

c. **Engineering Control:** Implementing the technology and design engineering in the machinery may reduce the waste and helps in managing the waste. For example: if a machine is producing a material by removing the material in the form of chip and chip is spreading everywhere. Then it will become difficult to manage such kind of waste and may encounter with some kind of accident. To control this, a collector of chip can be mounted on the machine to collect such chips so that it will manage easily.

d. **Administration Control:** Administration control may be applied to the machines which are continuously running without having a break. This will reduce the performance of the machine and will generate the waste in the form of oil and others. To reduce such kind of waste, machine should be operated and provided with the pre-defined breaks for resting. It will helps in presenting such kind of leakages and other problems.

e. **Personal Protective Equipment:** Personal protective equipment while handling different kind of waste is highly recommends. This is because, it has been seen that various hazard are associated with the waste generated due to different kind of activities. So, the preventive measure must be taken to avoid the encounter with such kind of problem.

5. Waste Disposal

Waste can be disposed in the different forms and could be explained as follows:

5.1. Composting and Vermi composting

This method is useful for the disposal of biodegradable waste. It may be defines as the waste which is easily decompose and can be remold into other useful product. Different biodegradable waste can be dumped in a pit for conversion into useful product which is known as composting.

The process of decomposition may take around 2 to 3 months. To make the process fast, red worms may be used for composting. This method is called vermin composting. Vermi composting is the high-quality manure.

5.2 Land Filling

The garbage used for filling a deep pit or hole or a ground is known as landfill. The garbage is loaded into the truck and dumped in the landfill. When that area is fully covered with the garbage, it is covered with layers of soil. Now it can be converted into a park or a playground.

5.3. Incineration

It is used to manage and disposing the medical waste generated in the industries or hospitals or any other concerned area of operation. Waste burning at high temperature is called at incineration. It will help in the reduction of wastage and could be disposed of easily.

6. 5Rs of waste disposal:

It is necessary to adopt/focus on 5Rs principles (Refuse, Reduce, Reuse, Repurpose and Recycle) of waste management for sustainable development.

Refuse: The first element of the 5 R's is Refuse. A practice to refusing the waste will help us to some extent but will be helpful if corporate in our industrial routine then it will be more effective and result producing in terms of waste management. Always try to decline the usage of non-recyclable or waste product in terms of refusing. While working with stake holders always keep sustainability the prime concern and purchase the sustainable packaging material only which will environment friendly and harmless. Revise procurement policy for the material and goods for preserving the environment from waste point of view. Set a standard SOP for the waste management in the business and organization context so as to minimize the usage of such product which could not be degraded after use then just refuse to use it.

Reduce: Lowering the generation of waste is also enable us to manage the waste indirectly but would be a good practice if maintained on routine basis. It will decrease the amount of toxic and dangerous product usage. Reduction will also depend on the end user what kind of the product they are going to purchase and what is the life cycle of it. It should also be consider and would help in reducing the waste. Environmental impact from such kind of activity can't be ignored or

over ruled because the positivity and negativity of such impact will help us decide the waste management existence. It is always recommended while using the product tries to reduce the waste generated due to it. It could be done in the various ways by taking small initiative. For instance like printing a paper a one side and not utilizing the other side is indirectly generating the waste, try to utilize the both side to maximum so that less waste generated.

Re-Use: The product which has one time use is now the old fashioned. It is the time to purchase the product which is versatile in nature and could be use in the multi ways so that life cycle of that product could be fully utilized. Nowadays we are seeing the trend of multiuse plastic in the industry which is quite commendable for all of the environmental preservers because it opens the different ways to manage the plastic. Remold yourself into new person by procuring the stuff which could be used again and again. It will create a positive impact on the environment and society in the productive manner and the outcome of it could be experience by all. It will be an intangible change that could only be experienced by the persons who are doing the same.

Redefine: Defining a product or thing in terms of its usage is called as the redefine in context of waste management. In broad way, it means a lot to someone who knows the potential in this definition For example a canister bought by someone which is full of the liquid that must be consumed by the customer there after the throwing of can is not good it could be used as the storage container for keeping other thing that would give it a new purpose. Similarly there are many ways to define the product or thing into other translation. It is the time to drive the kind of culture across the community to make them aware regarding the environment preservation by managing the waste. This will help us to preserve the world for our upcoming generation. Common station for pick and drop of such product that could be taken by the someone who need will provide the better result in terms of redefine the product.

Recycle: It is the only option we are left with after applying all the method of managing the waste it would be helpful only when it is impossible to manage the waste by applying the above mentioned method. Transforming a product into other useful product by some means is called as the Recycling. For illustration: transformation of the plastic into granules and then these granules will be heated and in molten form could be converted into the meaningful product. There are many companies in the society which are recycling the waste into useful means and approved from the pollution control board. The government is providing the grant and subsidy on setup of such kind of facility for managing the waste on national level. There are many in India who are

currently working and some are involve in the projects given by the government bodies such as engineering departments run by government.

These are the key method to manage the waste as of now and many are under development once developed will be shared.

7. Training & Awareness:

Training and awareness regarding the waste management must be imparted periodically by the qualified trainers and staff to the waste collector and segregators. Training & awareness plays an important role in improving the morale of the workers who are handling different kind of waste.

8. Safety Precautions while handling different kind of waste:

- Never attempt any suspicious waste which is not known.
- Always wear protective equipment prior to handling of any kind of waste.
- Always collect the waste in the segregated form like Solid, Liquid and others.
- Always try to pack the waste in the tight packing so that it will not spread.
- Disposal of waste should be at the authorized disposal agency and should not be left openly after collection.
- Hazardous waste like sludge, used black oil, e-waste and others must be disposed with care to the authorized dealer which are approved by the government bodies.
- Good housekeeping must be ensuring after collecting the waste from the area.
- Sanitization of the area must be done properly after collecting the vulnerable waste such as food scrap, vegetable remains and others.
- Storage of waste must be done where there is no possibility of fire or explosion and must be provide with the adequate fire safety measure like fire extinguisher, fire hydrant and sprinkler systems.

9. Conclusion: In India, the major problem associated with the development is the population growth. The current situation is that due to inadequate waste infrastructure, the informal sector and waste dumping sites are facing so many problems to deal with different kind of waste. Lack of interest and participation towards building a waste free community can be experienced by anyone who is seriously concerned about the waste management. There is utmost need for running the seminars and campaign for the public and community wellness towards changing the attitude for handling the waste and some fundamental training session could be act as the initiator in such kind of the activities. Sustainable and economical way of

managing the waste will help us to lower the waste generation and disposal of the same will be less cumbersome for any managing company or agency. One can think about the generation of the energy by utilizing the waste into useful mean such as extraction of oil from plastic waste. In India, it's a war like situation to manage this huge amount of waste generated every hour whether it is domestic or industrial. Till these fundamental requirements of managing the waste are met, India will continue to suffer from poor waste management and the associated impacts on public health and the environment.

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