

ZERO WASTE: NEED, ISSUES, CHALLENGES & ACTIONS

VINEET GUPTA^{a1} AND GOPAL SAH^b

^aDepartment of Mechanical Engineering, DKNMU, Newai, Rajasthan, India

^bGraphics Engineer, Melbourne, Australia

Abstract

Depletion of ozone layer, severe ailments in small age, aging effect in early age, increase in mortality rate due to newer diseases, suffocation, contaminated water & crops, sudden change in climatic and many more problems are surfaced in the last two decades. On analyzing, more are due to unhealthy environment for all leaving beings. In this paper, few issues, challenges and proposals are mentioned for serious focus for all of us.

KEYWORDS: Zero Waste, Sources of Waste, Treatment, Government Norms

Zero Waste

It is an approach that encourages in achieving zero waste [1] out of manufacturing methods and consumption by reusing the products. The aim is for no waste to be sent to soil, water & air. Zero waste is the waste management and planning approach to preserve all resources by responsible production & consumption to keep the environment healthy for today and for coming centuries for safe stay of all leaving beings that include human beings, fauna and flora.

Zero waste is not only eliminating waste through recycling and reuse, but focuses on achieving the zero waste goal by changing working habits & enhance knowledge. For that serious and consistent efforts must be there, not mere as ritual.

Need of Zero Waste

Few important objectives to achieve Zero Waste are:

- To protect environment
- To make safe and healthy place for all leaving creators for generations
- To eliminate waste
- To reduce costs by reduced need for raw materials by proper waste management

Issues

Have to go a long way to achieve initially at least half way towards Zero Waste Discharge. For that, first all of us to understand the issues obstruct the way to achieve it are-

- No sense of belongingness with environment

- No sense of responsibility for others health & concerns
- Lack of complete awareness
- Lack of seriousness
- Incompetent law forcing mechanism
- Lethargic attitude of law forcing agencies
- Corruption
- Costly waste management techniques

Challenges

Few challenges can be visualize easily on surface to achieve the objectives of Zero Waste Discharge, if not fully but better than fewer are as under:

- Categorization of wastes in particular region so to put in reduction/elimination process
- Respective availability of waste reduction technique[s]
- Plans to achieve zero waste discharge
- Cost, efforts & time requirement
- Environmental Impact Assessment
- Proper implementation, feedback & review mechanism
- Awareness campaign and their performance evaluation
- How to put in place the law enforcing mechanism

SOURCES OF WASTE

Few sources of wastes are categorized as under [2]:

Domestic Waste

It is generated during domestic activities and includes paper, glass, bottles, plastics, fabric, kitchen waste, garden litter, ashes of burnt wood, coal or cow-dung cakes etc. It makes unhygienic environment and causes mosquitoes and other harmful organisms breeding. Domestic waste includes:

¹Corresponding author

a. Garbage: It includes peels of fruit and vegetables, leftover food articles, garden litter, paper, glass, plastic goods, rubber goods, polythene bags, fabric etc. It is both organic [biodegrades] and inorganic [have long biodegrade processing time] in nature.

b. Ash: It is generated due to burning of wood, coal and dung cakes.

c. Sewage: It includes the waste water from kitchen and bathrooms.

Industrial Waste

In the process of production, leftover material is the industrial waste. It includes packing waste, cellulose fiber, paper scraps, bleaching powder, alkalis, wooden dust, construction waste, machines parts, tools, etc. It causes toxicity that is harmful for human beings and environment. Industrial waste includes:

a. Coal ash, rocks of no value, furnace slag, metallic scrap, etc. by Mining and Metallurgical industries.

b. Acids, toxic gases, oils, alkalis, and many types of synthetic materials by Chemical industries.

c. Petroleum gases, hydrocarbons, oils and other toxic organic chemicals by Oil refineries and Petrochemical industries.

d. Suspended particulate matter (SPM) in the form of coarse and fine particles that pollute air and cause respiratory disorder by Cement factories.

e. Debris of cement, sand, bricks, stone, wood, limestone, etc. by Infrastructure industries.

f. DVDs, music players, TV, Telephones, computers, vacuum cleaners and other electrical appliance those are of no more use, are electronic wastes/e-waste/e-scrap that are harmful to humans and environment.

Agricultural Waste

It is the waste generated during crop production and by farm animals that includes:

a. Plant remains- It includes husk and straw, wood and rubber waste, cotton and tobacco waste, coconut waste products, nutshells, etc.

b. Animal waste- Heaps of animal waste (excretory) that are left unattended emit a foul smell and breeds harmful microorganisms.

c. Processing waste-. Chemical fertilizers, pesticides, insecticides, fungicides, herbicides and other agrochemicals use in excess; Preparation of rice from paddy, flour from different grains, edible oils from oilseeds, etc. produces husk and cakes as waste affect environment and people.

Biomedical Waste

It is the waste generated in hospitals, pathological laboratories, and clinics that include syringes, needles, blades, scalpels, empty plastic bottles, polythene bags, gloves, tubes, expired medicines, pathological wastes (blood, tissues, body parts, and body fluids), waste from surgery and autopsy, etc. are toxic, hazardous, infectious and non-infectious both. The infectious waste contains large number of pathogens and is dangerous.

Nuclear Wastes

Radioactive wastes from the nuclear power and weapon industries remain radioactive for thousands of years and no safe method is available for permanent disposal of these wastes till date.

Sunita Narain, Director General of Centre for Science and Environment (CSE) has said that waste management can't do without segregation but there is no incentive to segregate. So, broad segregation of the wastes is as such:

Solid Wastes

These are the unwanted substances that are discarded by human society. These include urban wastes, industrial wastes, agricultural wastes, biomedical wastes and radioactive wastes.

Liquid Wastes

Wastes generated from washing, flushing or manufacturing processes of industries are called liquid wastes.

Gaseous Wastes

These are the wastes that are released in the form of gases from automobiles, factories or burning of fossil fuels and get mixed in atmosphere that occasionally cause smog, acid rain, etc.

Norms for Waste Discharge

Many norms are formed already and few are as under:

- Biomedical Waste Rules, 1998 [3] for handling of biomedical waste has applicable for hospitals and persons those produces, keeps, receive, carries and dispose in any form.
- Municipal Solid Waste Management [4]- National Green Tribunal in its judgment directed every state and Union Territory to enforce and implement the Solid Waste Management Rules, December, 2016 regarding steps to improve the practices presently adopted for collection, storage, transportation, disposal, treatment and recycling of Municipal Solid Waste and to make it mandatory for the power generation and cement plants within its jurisdiction to buy and use RDF as fuel in their respective plants, wherever such plant is located within a 100 km radius of the facility.
- Construction and Demolition [C&D][5] Waste Management Rules, 2016- Ministry of Environment and Forests recently notified that all generators of C&D waste must segregate it into four categories– concrete, soil, steel and wood, plastics, bricks and mortar – and then either deposit it at collection centers setup by the local authority or hand it over to processing facilities.
- Bio-medical Waste Management Rules, 2016 [6] released by the Union environment ministry has reduced in waste categorization from the earlier ten categories to four to eliminate the confusion faced by waste handlers and other healthcare workers and by clearly define the responsibilities of stakeholders, waste-generators and waste treatment facility operators, local authorities, state governments and pollution control boards.
- E-Waste Rules 2012 [Management and Handling] [7] specify EU norms for Indian electronics and focus more on Extended Producer Responsibility (EPR) clause where producers will be responsible for eco friendly management of their expired products.
- National Action Plan for Climate Change 2009 [Management and Handling] [8] directs for participation and involvement of the informal sector.

- Plastic rules 2011 [Management and Handling] [9] emphasis the need for participation and involvement of the informal sector for proper waste management.

ZERO WASTE DISCHARGE METHODS

Overall three broad methods [10] are used in partial way to achieve Zero Waste are:

Reducing Waste

Initialize to reduce the waste at source by consuming exact required quantity. Other ways of waste reduction are by possessing right quantity to meet requirement, by choosing the products those left out less waste and many more similar ways.

Reusing Waste

Another way is to reuse the products with essential repairs; like- repair the clothes, reuse the clothes by another one, retreading the worn out tyres of vehicle, etc.

Recycling Waste

Another out of many ways towards zero waste is to dismantle the waste product and use its functional parts in similar or new products.

Fewer methods in practice for waste disposal to achieve zero waste for particular type of waste are as such:

- Nuclear Waste Management cycle of safe disposal of radioactive waste is Custody, Carrying and Dumping by various means that well taken care by Government.
- Biodegradable Industrial waste may decompose by the action of certain microorganisms that includes Combustion, Composting, Gasification, Bio-Methanation, etc.
- Non-biodegradable Industrial waste cannot be decomposed completely. Still many reuse/disposals methods are in practice & others in developing/research stage. Wastes from one industry may utilize in another industry, like- slag and fly ash used in building construction, sand casting and brick manufacturing, metallic waste used in alloying materials, contaminated oil for rust prevention and rust removal, etc. Landfill, Incineration is few other methods.

Little details for potential methods/techniques for waste elimination/reduction/reuse are as such:

- Effluent Treatment Plants: Is the industrial waste water treatment method for its reuse and /or safe disposal to the environment. Various methods are used to treat the waste water of different industries.
- Accreditation with ISO 14000 [11] is a family of environmental management standards that help the organizations to (a) minimize environment affecting operations/processes; (b) comply with applicable laws, regulations & requirements; and (c) continually improvement in the above.
- Bio-Methanation plants [12]: As biodegradable component of India's solid waste is currently estimated at a little over 50 per cent. Bio-methanation is a solution for processing it, to reduce the load of landfill sites, to produce methane as alternate excellent fuel otherwise a harmful gas for environment.
- Bio-CNG plants [12]: It takes the process of Bio-methanation one step forward by using anaerobic digestion to produce biogas and organic manure and further processes the biogas to higher standards. The obtained gas can be replaced with LPG/CNG and diesel.
- Nearby Common Biomedical Waste Treatment Facilities [CBWTF]
- More & more use of potential available techniques. E.g.- Bio-Methanation plants, Bio-CNG plants [9], Effluent treatment plants, etc.
- Environmental Impact Assessment
- Proper implementation, feedback & review mechanism
- Accountability of waste generation & its conversion
- Motivate for accreditation with ISO 14000

REFERENCES

Definition of Zero Waste retrieved from zwia.org [Zero Waste International Alliance].

Sources of Waste retrieved from <http://www.shareyouressays.com/knowledge/6-most-important-sources-of-waste-in-india> in April, 2019.

Biomedical Waste Rules, 1998.

Notification by National Green Tribunal enforce and implement the Solid Waste Management Rules in December, 2016.

Gazette of India, Part-II, Section-3, Sub-section (ii); Ministry of Environment, Forest and Climate Change, March, 2016.

Bio-medical Waste Management Rules, 2016.

E-Waste Rules 2012 [For Management and Handling].

National Action Plan for Climate Change 2009 [For Management and Handling].

Plastic rules 2011[For Management and Handling].

Zero Waste methods retrieved from <https://byjus.com/biology/types-of-waste>

'ISO-14000 family- Environmental management' retrieved from www.iso.org.

Ahluwalia, I.J. [2016], 'Cities at cross roads: Recycling begins at home', an article in Indian Express on November 30, 2016.

PROPOSALS FOR FURTHER ACTIONS

Two approaches are in existence to reduce/eliminate the waste:

1. Cradle-to-grave- Where we are dumping the waste in one or many ways. But it is not the ultimate solution as it may come back with grave problem[s] in future.
2. Cradle-to-cradle- Where we recycled/reused/repared the waste to use in the form of a new product or in different products of convenience of transform them. It helps in to achieve the no waste objective.

Our immediate focus must be on following areas:

- Awareness & change in habits with sense of responsibility for all concerns
- Norms enforcement mechanism
- Focus on development of simple & cost effective waste management techniques
- Training programmes