IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Solid Wastes: Types, Sources, Management

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Abstract:

In everyday life, there are many types of waste materials continuously generating from various causes like domestic waste, industrial waste, chemical waste, agricultural waste etc. The solid waste can be described as domestic garbage**,** electronic waste material, construction debris**,** sludge from industries and metallurgical sites, discarded materials in plants and mining etc. Some of the waste is disposable, some is decomposable and some is reusable. Though various waste treatment methods are available, these are insufficient due to rapid industrialization, continuously growing population and high standards of living society. Hence more effective methods are required. Present article is focused on various methods for solid waste management used in our country.

Key words: wastes, domestic garbage, disposable, reusable, effective etc.

Introduction:

Twenty first century is the age of tremendous progress based on advanced technologies and industrial development. Science has made life easy and luxurious by means of large technical things. But with this development, many problems are also continuously arising. Nowadays production of solid waste material and their proper management is very important and it is one of the most serious and major concern. Though there are waste treatment plants and recycling systems, these are inadequate and non-effective due to very high generation of solid waste materials.

India is known to be highest populated and continuously developing country in the world. Hence daily very high production of solid waste takes place by means of various sources. Nowadays continuously growing industrialization, rapid and unplanned urbanization, migration of rural population towards cities, high uses of synthetic and chemical goods and changing high standard lifestyles have created major concern of solid waste management. Generally organic waste material contains foods, vegetables, dead and decayed debris that are

degradable and can be easily decomposed. But some waste materials like chemical waste, electronic waste, construction site debris, paper and plastic materials etc. are non-degradable [1]. In this modern age, high use of paper, plastics, use and throw material, non-reusable material, electronic waste etc. are the major content of solid wastes that cannot be decomposed.

At the beginning there was very little and casual awareness about the management solid wastes. But, since last 10-20 years, the outline of waste management of solids has been changed. Continuously our government is prominently paying attention on proper management of waste. But still, there are many obstacles and it is a long way process to apply an effective waste management in practice. Currently, only minor portions of solid wastes produced is disposed and recycled by using appropriate operation process. Inadequacy of proper solid waste separation is the main obstacle to implement an effective management for solid waste [2]. Nowadays, recycling processes of some wastes of plastic, glass and paper is increasing. But due to improperly handling and collection, also there is no proper transports are available, limitations of advanced treatment procedures, financial scarcity in corporate sector, casual behavior of society towards waste material. So, these are the factors responsible for unsatisfactory waste management practices. Hence it is very considerable to lighten the hazards associated with different wastes as well as advantages of proper segregation of solid materials to the society.

Common sources of solid wastes:

Domestic wastes:

Domestic solid wastes generate by means of various household activities. It is generally containing food stuff, household garbage, broken things, clay models, broken glass utensils, wood, metals, paper, useless electronic items etc. [11].

Industrial waste:

Industrial wastes generate from various manufacturing units, processing units, Industries, power plants etc. It generally contains hazardous wastes, ashes, spent washes, broken materials, plastics etc. [12].

Construction site waste:

Main sources of such type of waste are new construction sites, demolishing sites, drainage works, road constructions and repairing etc. It generally contains wood, steel, concrete, dust, rocks and bricks, plastic bags and materials, empty unusable cans etc. [13].

Agricultural waste:

Most of agricultural waste generates from farms, crops, yards, dairies, orchards, animal husbandry plants etc. These includes agricultural wastes, pesticides, chemical fertilizers, animal wastes etc. [14].

Commercial and institutional waste:

Commercial and institutional wastes generate from various public places like hotels, restaurants, schools, colleges, parks, movie theatres, shopping malls, markets, picnic spots, office buildings etc. It contains large variety of wastes like food, plastic, papers, stuffs etc. [15].

Medical waste:

Such type of waste can be regarded as biowaste. It generally forms at hospitals, medicals, mortuaries etc. It contains needles, syringes, expired medicines, biological wastes, broken equipments etc. Most of medical waste is hazardous and critical to treat [16].

Mining waste:

The material originates from various metallurgical sites, open cast mines and underground mines such as ores, minerals, soil, rocks, gaunge, ash etc. [17].

Municipal waste:

Waste generates in road cleaning, parks, water treatment plants, corporation sites, recreational areas etc. Like general waste, sludges, garbage etc. [18].

Methods of treatment

There are variety of methods for treatment of solid waste materials. Like mechanical biological treatments and thermal treatments.

Landfilling:

It is the most very and easiest way to dispose wastes like solids. But it is inconvenient way of waste management. In this type, all types of collected waste material is dumped at landfilling sites. Here garbage is dumped without proper segregation. All decomposable, non-decomposable, inert, organic matter and garbage are refused and deposited in lands. Hence, they becomes the serious source of greenhouse gases like CO2, CH4 [4]. Some heavy metals like lead, mercury, cadmium, arsenic and other hazardous matter get mixes in groundwater, that contaminates water quality and increases toxicity [2]. Landfilling sites are responsible for growth of insects, worms, mosquitos and they can spread malaria, cholera, dengue etc. Some poor people frequently visit these sites in search of material for money. But they often get in contact with such unhealthy and dirty atmosphere which results into serious diseases [2]. Peoples living near these sites also have some problems in respiratory system, headache and irritation in eyes due odor [2, 4].

Composting:

In rural areas, farmers use this method of composting organic material like cow dung, agricultural waste [2]. In this method Micro-organisms decomposes waste in different conditions sometimes warmer, humid, aerobic as well as anaerobic [4]. This technique is very easy and cheap, and this is very effective and useful for agricultural fields, gardens, and also in parks etc. [4]. It reduces the use of chemical fertilizers in agriculture field. It increases the fertility of soil, and texture. It also maintains the health of soil by increasing its moisture-holding capacity and nutrients are recycled into soil. It provides the best alternative to chemical fertilizers, that results in decrease in soil pollution and also management of agricultural waste takes place effectively.

Verme-Composting:

Verme-composting is a technique in which biological and decomposable solid wastes, is composted by using earthworms [5]. Wastes in agriculture, household, canteen food stuff, organic waste material, animal wastes etc. is mixed and earthworms are inserted into it. Verme-compost contains high nutrients that are essential for crop growth and increases soil fertility. It can be also used to improve soil quality. Many species of earthworm survive only at 20–40 °C and moisture content range is in between 20 to 80% [3]. These worms have very high rate of consumption of organic waste and conversion into compost [6]. Largest Verme-composting plant is present in Bangalore. Capacity of the plant is about 100 metric tons per day [2]. Some plants in Verme composting are nowadays has become one of the most ecofriendly techniques, which is not only effective for soil remediation but also helpful in reduction of organic agricultural wastes. But this method possesses some limitations. The material which is toxic present in waste can kill earthworms. The specific setup and large area is required for process of land composting [8]. Also, manpower is essential in such plants.

Anaerobic Digestion and Bio methanation:

In this process, organic solid waste material like agricultural waste, cow dung, animal waste etc. is decomposed with the help of microorganisms to produce methane gas. This biogas which contains methane can be used for cooking and power generation. Its inert residue is also rich with nutrients which are used as bio fertilizers and manures. These are useful to increase soil fertility and improve soil quality. This method is better than composting. Because energy production and biofertilizers are produced with no pollution along with solid waste decomposition [19-21].

Thermal treatments:

Thermal treatments are mainly used for decreasing the toxic wastes released and for the treatment of residual part. These methods are incineration, gasification and pyrolysis

Incineration:

It is the process in which solid wastes material are disposed for combustion at high temperature by a proper channel [7]. The temperature range for this process is about more than 950^0C [8]. Thus, at this temperature the conversion of all waste material takes place into ash in the form of residual part and the emission of gases takes place. In this process toxic is destructed and there is recovery of high energy. In this incineration process up to 80–90% wastes are decomposed [8]. To reduce transportation cost such type of thermal plants are constructed and developed near to the source of the waste. Incineration method requires less area for setup. Hence it is effectively used in metropolitan cities where insufficient places for landfilling occurs. But method requires specific setup. Hence it is expensive and requires skilled persons.

Pyrolysis:

Pyrolysis is a process in which the waste solid substances are degraded thermally in absence of oxygen [2]. In pyrolysis, the temperature range required is near about greater than 300^0C and up to 850 °C. Therefore, continuous external heat source is essential [2]. The products formed at the end of pyrolysis process are synthetic gases and char. The main constituents of char are Carbon and non-combustible materials while synthetic gas contains CH_4, CO, H_2 etc. as major content [9]. These gases are useful for fuel oil generation, wax and tar preparation.

Gasification:

This is the process of partial oxidation of substance in the limited supply of oxygen gas. It is the process which is between combustion and pyrolysis [10,11]. The temperature requirement f or Gasification is generally greater than 650°C [10]. Hence wastes are dried and properly segregated before application. During the operation the synthetic gas viz hydrogen, carbon monoxide and methane generate. These gases are used as fuel gases as an alternative of natural gas. Thus, energy is also recovered. In this process there is no emission of any type of toxic gas like SOx, NOx due to insufficient supply of oxygen gas. But this process is costly and requires large amount of economical and power source. After gasification, there should be proper disposal of the non-combustible solid residual ashes. Hence the method is more convenient than incineration.

Conclusion:

Solid waste disposal has become major concern in all over the world. Though many countries have initiated for sustainable remedies towards this issue, it is not sufficient as compared to seriousness of problem. Hence it is very important to develop and implement more effective techniques of solid waste disposal. Government and NGOs should take initiate to boost various remedies. There should be public and social awareness for segregation and handling of solid waste in particular way.

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