IMPACT OF SOLID WASTE ON HEALTH AND THE ENVIRONMENT

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Abstract- Urbanization and population growth are solely responsible for high increasing rate of solid waste and its proper management is a major problem of Municipal Corporation. In this study, the sources and components of solid waste were identified; type and the quantity of solid waste disposed, methods of solid waste disposal and impact of improper waste management on health were highlighted. The result shows that excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases.

I. INTRODUCTION

Improper MSW disposal and management causes all types of pollution: air, soil, and water. Indiscriminate dumping of wastes contaminates surface and ground water supplies. In urban areas, MSW clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of MSW and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in landfills, and untreated leachate pollutes surrounding soil and water bodies. Health and safety issues also arise from improper MSWM. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants. The U.S. Public Health Service identified 22 human diseases that are linked to improper MSWM. Waste worker and pickers in developing countries are seldom protected from direct contact and injury, and the co-disposal of hazardous and medical wastes with MSW poses serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also contribute to overall health problems. People know that poor sanitation affects their health, especially in developing and low-income countries, where the people are the most willing to pay for environmental improvements (Rathi, 2006; Sharholy et al, 2005; Ray et al., 2005; Jha et al., 2003; Kansal, 2002; UDSU, 1999; Kansal et al., 1998; Singh et al., 1998; Gupta et al., 1998; Tchobanoglous et al., 1993).

II. CHARACTERIZATION OF WASTES

Solid waste are characterize on the basis of following parameters [1]

- Their sources
- By the types of wastes produced
- By generation rates and composition.

Accurate information in these areas is necessary in order to monitor and control existing waste management systems and to make regulatory, financial and institutional decisions.

III. TYPE OF SOLID WASTE

Depending on their source the solid waste may of different type such as[2,3]
Residential waste

- Industrial
- Institutional
- Construction and demolition
- Municipal services

IV. CHARACTERISTICS OF SOLID WASTES

- Corrosive: these are wastes that include acids or bases that are capable of corroding mental containers, e.g. tanks[3]
- Ignitability: this is waste that can create fires under certain condition, e.g. waste oils and solvents
- Reactive: these are unstable in nature, they cause explosions, toxic fumes when heated.
- Toxicity: waste which are harmful or fatal when ingested or absorb.

V. SOLID WASTE TREATMENT

Current treatment strategies are directed towards reducing the amount of solid waste that needs to be landfilled, as well as recovering and utilizing the materials present in the discarded wastes as a resource to the largest possible extent. Different methods are used for treatment of solid waste and the choice of proper method depends upon refuse characteristics, land area available and disposal cost they are as follows [3,4].

- Incineration

- Compaction
- Pyrolysis
- gasification
- composting

A. Incineration

It is a controlled combustion process for burning solid wastes in presence of excess air (oxygen) at high temperature of about 1000 ^{o}C and above to produce gases and residue containing non-combustible material. One of the most attractive features of the incineration process is that it can be used to reduce the original volume of combustible MSW by 80–90%.

B. Compaction

The waste is compacted or compressed. It also breaks up large or fragile items of waste. This process is conspicuous in the feed at the back end of many garbage collection vehicles. deposit refuse at bottom of slope for best compaction and control of blowing litter[5].

C. Pyrolysis

Pyrolysis is defined as thermal degradation of waste in the absence of air to produce char, pyrolysis oil and syngas, e.g. the conversion of wood to charcoal also it is defined as destructive distillation of waste in the absence of oxygen. External source of heat is employed in this process. Because most organic substances are thermally unstable they can upon heating in an oxygen-free atmosphere be split through a combination of thermal cracking and condensation reactions into gaseous, liquid and solid fraction[5].

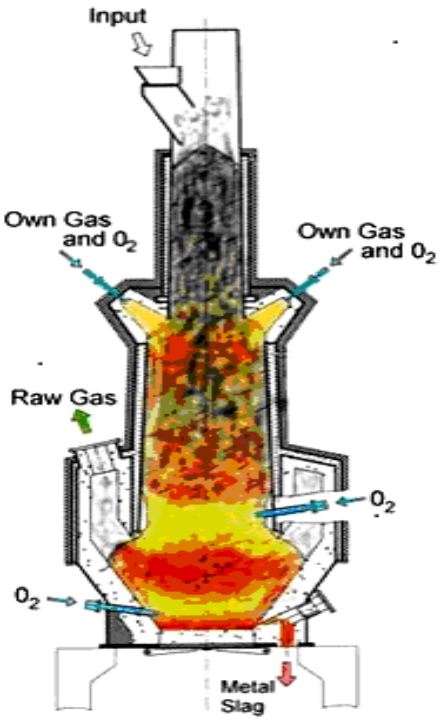

Fig. 1 Process of the pyrolysis system

D. Gasification

Gasification is a process in which partial combustion of MSW is carried out in the presence of oxygen, but in lesser amount than that is required for complete combustion, to generate a combustible gas (fuel gas) rich in carbon monoxide and hydrogen e.g. the conversion of coal into town gas. When a gasifier is operated at atmospheric pressure with air as the oxidant, the end products of the gasification process are a low-energy gas typically containing (by volume) 20% CO, 15% H_2, 10% CO_2 and 2% CH_4[5].

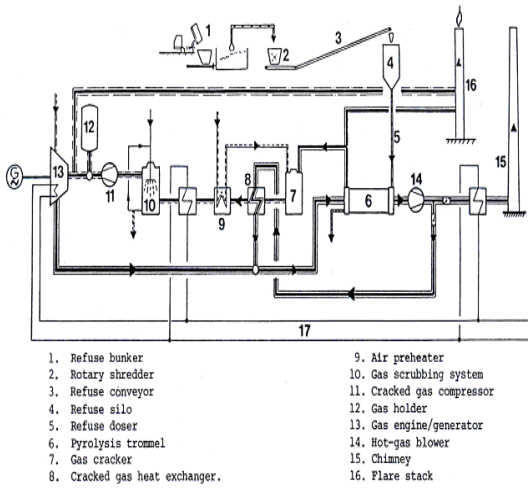

Fig. 2 High temperature gasification process for MSW treatment

E. Composting

Composting is the most responsible technical solution for many developing countries especially, where the climate is arid and the soil is in serious need of organic supplements. The composting process usually follows 2 basic steps as shown in Fig. 2.13**,** which may be preceded or followed by pre- or post-treatments (crushing, sorting, humidification, mixing with other waste, etc…)[5].

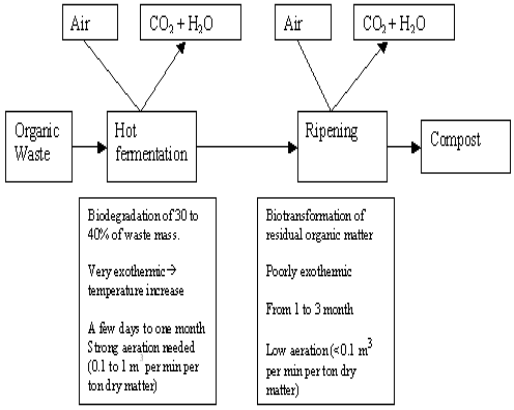

Fig. 3 Composting stages (pre- and / or post treatments may be needed)

VI. WASTE DISPOSAL

- Landfills:- Landfilling is the most simple and economical measure as far as natural decomposition occurs at the disposal site.

Unscientific and ordinary Landfilling is the common practice for solid waste disposal in many developing countries [6,7].

- Sanitary Landfills:- Sanitary Landfilling is a process of dumping of MSW in a scientifically designed area spreading waste in thin layers, compacting to the smallest practicable volume and covering with soil on daily basis. The methane (rich biogas) is produced due to anaerobic decomposition of organic matters in solid waste[6,7].
- Underground injection wells:-waste are injected under pressure into a steel and concrete-encased shafts placed deep in the earth.
- Waste piles:- it is accumulations of insoluble solid, non flowing hazard waste. Piles serves as temporary or final disposal
- land treatment:- it is a process by which solid waste, such as sludge from wastes is applied onto or incorporated into the soil surface.

VII. CAUSES OF INCREASE IN SOLID WASTE

- Population growth
- Increase in industrials manufacturing
- Urbanization
- Modernization

Modernization, technological advancement and increase in global population created rising in demand for food and other essentials. This has resulted to rise in the amount of waste being generated daily by each household [7,8].

VIII. ADVERSE EFFECTS ON LIVING ORGANISM DUE TO SOLID WASTE

- Populations in areas where there is no proper waste treatment method.
- Children
- Waste workers
- Populations living close to waste dump
- Animals

IX. SOURCES OF HUMAN EXPOSURES

The group at risk from the unscientific disposal of solid waste include – the population in areas where there is no proper waste disposal method, especially

- Pre-school children
- Waste workers
- Workers in facilities producing toxic and infectious material

Other high-risk group includes population living close to a waste dump and those, whose water supply has become contaminated either due to waste dumping or leakage from landfill sites. Uncollected solid waste also increases risk of injury, and infection.

X. POINTS OF CONTACT TO LIVING ORGANISM

There are number of point by which solid waste may be come in contact with living organism such as

- Soil adsorption, storage and biodegrading
- Plant uptake
- Ventilation
- Leaching
- Insects, birds, rats, flies and animals
- Direct dumping of untreated waste in seas, rivers and lakes results in the plants and animals that feed on it

XI. IMPACTS OF SOLID WASTE ON HUMAN HEALTH, ANIMALS AND AQUATICS LIFE

There are potential risks to environment and health from improper handling of solid wastes. Direct health risks concern mainly the workers in this field, who need to be protected, as far as possible, from contact with wastes. There are also specific risks in handling wastes from hospitals and clinics. For the general public, the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats [10].

Uncontrolled hazardous wastes from industries mixing up with municipal wastes create potential risks to human health. Traffic accidents can result from toxic spilled wastes. There is specific danger of concentration of heavy metals in the food chain, a problem that illustrates the relationship between municipal solid wastes and liquid industrial effluents containing heavy metals discharged to a drainage/sewerage system and /or open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle including these some other types of problem are as follows [10,11].

- Chemical poisoning through chemical inhalation
- Uncollected waste can obstruct the storm water runoff resulting in flood
- Low birth weight
- Cancer
- Congenital malformations
- Neurological disease
- Nausea and vomiting
- Mercury toxicity from eating fish with high levels of mercury
- Plastic found in oceans ingested by birds
- Resulted in high algal population in rivers and sea.
- Degrades water and soil quality

XII. IMPACTS OF SOLID WASTE ON ENVIRONMENT

The decomposition of waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in developing nations. Very few existing landfills in the world□s poorest countries would meet environmental standards accepted in industrialized nations, and with limited budgets there are likely to be few sites rigorously evaluated prior to use in the future. The problem is again compounded by the issues associated with rapid urbanization [11]. A major environmental concern is gas release by decomposing garbage. Methane is a by-product of the anaerobic respiration of bacteria, and these bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition (Cointreau-Levine, 1997). A second problem with these gasses is their contribution to the enhanced greenhouse gas effect and climate change [11]. Liquid leachate management varies throughout the landfills of the developing world. Leachate poses a threat to local surface and ground water systems. The use of dense clay deposits at the bottom of waste pits, coupled with plastic sheeting-type liners to prevent infiltration into the surrounding soil, is generally regarded as the optimum strategy to contain excess liquid. In this way, waste is encouraged to evaporate rather than infiltrate[10]

XIII. PREVENTIVE MEASURES FOR REDUCTION OF ADVERSE IMPACT ON ENVIRONMENT AND HUMAN

Proper solid waste management have to be undertaken to ensure that it does not affect the environment and not cause health hazards to the people living there. At the household-level proper segregation of waste has to be done and it should be ensured that all organic matter is kept aside for composting, which is undoubtedly the best method for the correct disposal of this segment of the waste. In fact, the organic part of the waste that is generated decomposes more easily, attracts insects and causes disease. Organic waste can be composted and then used as a fertilizer.These steps may be taken for prevention of impact

- Generation of waste should be decreased
- promoting the production of goods which minimize waste generation after use
- Material recycling and recovery should be increased
- promoting the use of plastic recycling identification codes and labels in order to make sorting and recycling of plastic packaging easier
- Municipalities increasing their level of service to the public regarding sorting of waste.
- Education of producers, the public and people who work in the waste sector should be increased
- Promoting the use of less hazardous alternatives to hazardous chemicals during production of goods.
- Legislation in the waste sector should be improved
- collection of hazardous waste at collection points shall be safe, secure and performed in an environmentally sound manner

XIV. CONCLUSION

The focus of the study was on impact of Solid waste due to non engineering and non scientific disposal. It is found that with increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases.

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