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Importance of Integrated (Manual Labour Intrinsic and Mechanized) Solid Waste Management System

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Abstract

A critical evaluation of old and new modern mechanized dispose system of municipal solid waste of Ahmedabad city, Gujarat is carried out in respect to its effectiveness, efficacy, its impact on the important role played by human waste picker and air pollution is analyzed.

Keywords: Waste pickers, Waste management, Landfills, Incinerators.

Introduction

Waste management is one of the important services provided by most urban authorities. Solid wastes need to be characterized by sources, generation rates, types of wastes produced and composition in order to monitor and control prevailing waste management systems while improving the existing system. As per the conservative estimation done by the World Bank in 1999, the municipal solid waste (MSW) from urban areas of Asia has gone up from 760,000 tons/day in 1999 to 1.8 million tons/day in 2025. With the increasing income in the countries of Asia, the solid waste management would be more challenging in the coming days in the continent [1]. MSW generation is over-riding the population growth in Indian mega-cities [2].

Municipal solid waste (MSW) generally includes degradable (paper, textiles, food waste, straw and yard waste), partially degradable (wood, disposable napkins and sludge) and non-degradable materials (leather, plastics, rubbers, metals, glass, ash from fuel burning like coal, briquettes or woods, dust and electronic waste). Generally MSW is managed as collection from streets and disposal at landfills. Anaerobic decomposition of MSW in landfills generates about 60% methane (CH₄) and 40% carbon dioxide (CO₂) together with other trace gases [3]. This percentage differs spatially due to waste composition, age, quantity, moisture content and ratio

of hydrogen/oxygen availability at the time of decomposition (e.g. fat, hemicelluloses etc.).

Coming on to a more localized level, the Ahmedabad Urban City has a population of 55.6 lakhs (2009) of which 78 percent is residing within the municipal area. Ahmedabad has been the primate city of Gujarat, the largest in terms of the population size and contribution to state income. Over the years, rapid urbanization has led to spreading of population outside the city limits [4].

Because of such high expansion in the amount of population has led to the generation of a tremendous amount of waste as well. Solid Waste collection and disposal in Ahmedabad is being carried out by Ahmedabad Municipal Corporation as an obligatory function. The total waste generated in the city is of the order of 2200 tons per day. Based on the 2005 statistical records by AMC are [4].

Table 1. Statistical record of waste by AMC (2005)

Waste Generation: Total (Tons/day)	2200
Generation: Per capita (Kg/day)	0.419
Moisture Content of waste	45%
Density of waste (Kg)	0.5 kg/cu.mt
Distance of disposal point	3-22 kms
By Corporation (T/Day)*	1676
Collection/Capita	0.419

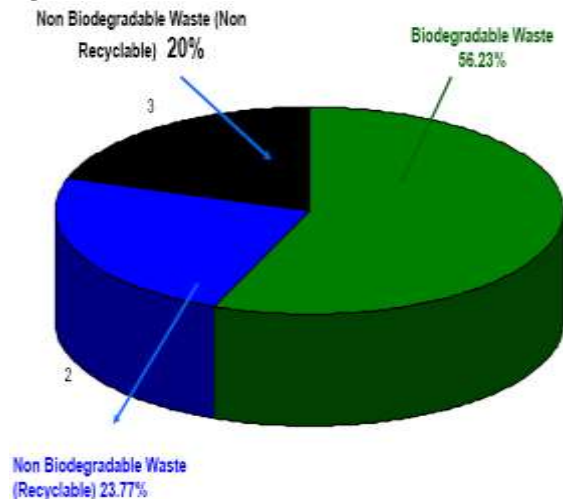
Views and remedies

The waste recycling process and its network in Ahmedabad is well established. There are a substantial number of formal/ informal actors involved in this activity. The waste materials from various sources reach the processing units via these actors. Among the major recyclable waste material in terms of its volume are scrap iron, paper waste, card board and glass. The overall pattern of the flow of the recyclable and reusable waste is circular in nature from origin to the destination. There are two major sources of waste materials namely, accountable source which includes household, factory, offices, institutions and shops and establishments and the unaccountable source which includes dustbins, community bins and municipal bins. Larger fractions of wastes were inert originating from households, street sweeping and ash [4]. Because of the amount of waste generation, in the periphery the urban local bodies have initiated measures to collect solid waste through a door-to-door collection system. The waste originating from these various formal and informal sources comes to the retailers via waste pickers (Rag pickers) and Kabadiwalas. Thereafter, the waste goes to the bulk buyer (dealer) in the central zone from where it reaches the recycling and processing units. In every part of the India, 1% of the total populations are waste pickers.

The waste that is generated can be bifurcated into three main categories [5]

- Non Biodegradable waste: 20%
- Biodegradable waste: 56.23%
- Non Biodegradable (Recyclable): 23.77%

Figure:



Statistics of types of waste

Old Dispose System

Based on the segregation, the recyclable waste is again reused in either a different form or reshaped to create another instrument, thus increasing the life of the material itself. The biodegradable waste is collected together and poured down in a landfill and covered up with soil, that can further generate methane and other biofuels that also help us in generation of power. The remaining non bio degradable and non recyclable waste is poured down an incinerator where it is burnt in a scourging heat. It is a part of the waste pickers’ duties to segregate all the waste into these categories. They would usually sell the recyclable material and earn some extra cash for their sustainability while send the rest of the waste to the recycling and processing units nearby.

AMC had initiated and implemented a concept of Public Private Partnership for collection of waste at point of its generation (i.e. door to door waste collection). In Ahmedabad there are total 1381907 properties, 1286188 residential and 95719 commercial properties. Among these 1198101 Residential properties i e 93% properties, i.e. and 44101 Commercial properties, i.e. 46% were covered under daily door to door waste collection system. 1075 Resident Welfare Associations & NGOs were working in this system. Collected waste was off load at nearby container site / spot from where vehicle would lift it and transported it to dump site for final disposal.

Modernization of System-

With the modernization of the world, from July, 2010, AMC developed and implemented a new system (Door / Gate to Dump Waste Collection System) of waste collection. Of Six Zones, where the contractor use closed body Hydraulic Euro III vehicles for lifting solid waste from residential units in the morning hours, which contains mainly biodegradable waste and in the post afternoon hours from the commercial units which contains mainly dry waste. All vehicles are equipped with GPS monitoring system.

As the saying goes, everything good comes with some drawbacks. There were certain issues that rose up with the new system.

1. The arrival timing of these trucks keeps on fluctuating.
2. The people appointed in these systems do not desegregate the waste; they just collect it and dump it to the landfill site.
3. Because of contractors like this, most of the waste pickers have lost their jobs and it has

led to a drastic rise in the level of unemployment.

But the major problem is the landfill site itself. It is open and slowly burning with low flames, generating lots of toxic gases. Landfill gas is about 40-60% methane, with the remainder being mostly carbon dioxide (CO₂). Landfill gas also contains varying amounts of nitrogen, oxygen, water vapor, sulfur and a hundreds of other contaminants. Inorganic contaminants like mercury are also known to be present in landfill gas. Sometimes, even radioactive contaminants such as tritium (radioactive hydrogen) have been found in landfill gas. When halogenated chemicals (chemicals containing halogens - typically chlorine, fluorine, or bromine) are combusted in the presence of hydrocarbons, they can recombine into highly toxic compounds such as dioxins and furans, the most toxic chemicals ever studied [6-8].

Burning at high temperatures doesn't solve the problem as dioxins are formed at low temperatures and can be formed as the gases are cooling down after the combustion process. Matter cannot be created or destroyed. We trust the destruction efficiency of various landfill gas combustion technologies and usually assume that about 98% or more this toxin gets destroyed. In other words, we pretend that these halogenated non-methane organic compounds simply go away. There is almost no talk about what happens to the chlorine, fluorine and bromine atoms that go into the burner. Mercury and tritium cannot be destroyed through combustion and no efforts have been made to prevent their release into the environment when landfill gas is collected and burned. Landfills Make Mercury More Toxic.

Incinerators- occupational hazard

Taking in account how incinerators affect the waste pickers in Delhi [9]. A small non-governmental organization (NGO) servicing India's waste-pickers, claims that more than one percent of Delhi's population is engaged in waste-picking

- (i) A significant source of revenue for the poorest
- (ii) They recycle nine percent to 59 percent of all of the waste generated in the city.

“These waste-pickers are providing a public service—for free”

But a waste incinerator now proposed in Timarpur, a suburb of Delhi, may change all that. Like other incinerators, this one will generate cancer-causing dioxins, mercury, and other heavy

metals and persistent organic pollutants. What is new and different about this particular waste incinerator? It will generate carbon credits under the Clean Development Mechanism (CDM).

Marginalization of waste pickers-

Waste-pickers are being harassed by dump managers and actively denied access to the dry, high-calorie items the incinerator will devour. They are also denied access to the waste stream. Instead, they go through the ash, looking for metal, the only substance to survive incineration intact. It is seen people picking through thigh deep incinerator ash for metals. In present system human bodies becomes a toxic absorber and it is being readily spoon-fed by the present scenario.

Proposed solution

The best solution for the good waste management and disposal system is to integrate manual labor oriented methods with modernized mechanical system. In this system the waste pickers can be assigned a part to collect the waste from door to door or from the premises of every institute. The collected waste can be sorted out at appointed area provided by the waste managers within the collection area. The waste pickers should be provided with protective tools like

- (i) hand gloves
- (ii) foldable chairs
- (iii) rubber boots
- (iv) Small trolley to carry the waste container with a drinking water bottle space designed.

The simplest solution to solve above said problem is that, the waste generating these toxins should not be dumped at waste site and this becomes possible only when the collected waste is sorted out first by waste pickers. The waste picker can desegregate the various components of the collected waste and they should be allowed to take away recyclable material which they can sell and earn out of it as a part of their remunerations. The bio degradable and non bio-degradable heaps of waste can be loaded in the separate container of the waste collecting van at the disposal site. Bio-degradable waste can be utilized to create manure after proper processing and non bio degradable can be disposed off by the best of the methods complimenting the environment.

At the sight the production of landfill gases especially methane should be extracted by proper technology and can be utilized by nearby industries or for the electricity generation. Landfill site

generates huge amount of Methane as a product of anaerobic process of biodegradables. This gas gets trapped in the pockets of waste heaps. If a technique can be devised to collect this gas than it can be utilized as a fuel for the industries or it can be used to generate electricity in a nearby plant.

Conclusion

Previously the waste management system was not very much systemized. Every available tool and methodology was employed for the waste collection of the city. The various segments were like labor intrinsic manual collections by waste pickers, ward to ward collection was done with semi automatic hand cart and area wise collection was done in a waste container placed at strategic points. These containers were use to be picked by motorized vehicles and the total waste was dumped at open collection site. This was not a very perfect system as various segments of waste collection were not synchronized and were not complimenting to each other.

To make the waste management system more efficient, the policy makers and implementers opted for totally mechanized waste collection and disposal system; marginalizing waste pickers. This system created two problems –

1. Almost 1% population of the city lost their livelihoods so the system created poverty and hunger.

2. The mechanical system could not desegregate the different components of collected waste like bio degradable, bio non degradable, recyclable material. They dumped everything at the dumping site. Now this mixed waste, the proportion of various landfill gases' emission increased by many folds creating environment problem, same thing happens when the waste is disposed in incinerators as they also emit very high proportion of harmful gases in the environment.

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