Chapter 1

Evolution of Solid Wastes Management

Introduction

Solid wastes comprise all wastes arising from human and animal activities that are normally solid and that are discarded as useless or unwanted.

It include Heterogeneous material Such that those come from urban community and homogeneous material such that material come from agricultural, industrial and mineral communities.

1-1 Solid Waste - a consequence of life

In early time, there is not any problem

A) Small amount of S.W
B) Large amount of land.

Farmers recycle S.W for fuel or fertilizer values.

Problems with the disposal of wastes can be traced from the time when humans first began to congregate in tribes, villages and communities and the accumulation of wastes become a consequence of life.

Throwing wastes into the unpaved streets, roadways and vacant land led to the breeding of rats with their attendant fleas carrying bubonic plague.

The lack of S.W.M led to the epidemic of plague, the Black Death, that killed half of the fourteenth Century Europeans.

The public health control measures began is the nineteenth century.

Food wastes had to be collected and disposed of in a sanitary manner to control rodents and flies the vectors of disease.

The relation ship between public health and the improper storage, collection and disposal of S.W is quite clear.

Public health authorities have shown that rats, flies and other disease vectors breed in open dumps, as well ad in poorly constructed or poorly maintained housing, in food storage facilities and other places where food and environment are available for rats and the insects associated with them
Liquid from dumps and poorly engineered landfills has contaminated surface waters and ground waters.

The liquid leached from waste dumps may contain:

Toxic elements such as copper, arsenic, and cadmium.
Unwanted salts such as calcium and magnesium.

Although nature has the capacity to dilute, disperse, degrade, absorb, or otherwise reduce the impact of unwanted residues in the atmosphere, in the waterways and on the land, ecological imbalances have occurred where the natural capacity had been exceeded.

1-2 Waste Generation in A technological Society

The development of technological society can be traced at the beginnings of industrial revolution.

At the 1888 England prohibiting the throwing of solid waste into ditches, rivers and waters.

At 1899 in USA.

Thus, along with the benefits of technology have also come the problems associated with the disposal of the resultant wastes.

Materials Flow and waste generation

1. S.W are generated at the start of the process, beginning with the mining of raw materials.

2. S.W are generated at every step in the process as raw materials are converted to goods for consumption .

The best ways to reduce the amount of S.W that must be disposed:
1) Reduce the consumption of raw materials (give an example)

2) Increase the rate of recovery and reuse of waste material.

Although, the concept is simple, effecting this change in a modern technological society has proved extremely difficult. (why)
Unlike water-borne and air-dispersed wastes, solid waste will not go away.

The effects of technological advances

Modern technological advances in the packaging of goods a constantly changing set of parameters for the designer of solid waste facilities.

Increasing use of plastics and the use of frozen foods reduce the quantities of food wastes in the home but increase the quantities at agricultural processing plants.

For example: the use of packaged meals, results in almost no wastes in the home except for the packaging materials.

These continuing changes present problems, because the design must be functional and efficient over its useful life.

Important questions arise

Which elements of society generate the greatest quantities of S.W and what is the nature of these wastes?
How can the quantities be minimized?
What is the role of resource recovery?
Can disposal and recovery technology keep up with consumer product technology?

1-3 The development of S.W.M.

Solid waste management may be defined as a system associated with the control of generation, storage, collection transfer and transport, processing and disposal of S. W in a manner that is in accord with the best principles of public health, economies, engineering conservation, aesthetic and other environmental considerations, and that is also responsive to public attitudes.

It include all administrative, financial, legal, planning and engineering function involved in solution to all problems of S.W

The solution may involve

Political science
City and regional planning
Geography
Economic
Public health
Sociology
Demography
Communications
Conservation
Engineering and material science

Historical development

The most commonly recognized methods for the final disposal of solid waste at the turn of the century were

1) Dumping on land
2) Dumping in water
3) Plowing into the soil
4) Feeding to hogs
5) Reduction
6) Incineration

Not all of these methods were applicable to all types of wastes.

In 1940sanitary landfills are known in USA

Functional elements of waste management system

1) The quantity and diverse nature of the waste
2) The funding limitations for public services
3) The impact of technology
4) The emerging limitations in both energy and raw materials

The activities associated with the SWM

1) Waste generation
2) Waste handling and separation, storage and processing at the source

3) Collection
4) Separation and processing and transformation of S.W
5) Transfer and transport
6) Disposal

Waste generation: at present

Waste generation is an activity that is not very controllable in future, more control will be exercised over the generation of wastes.

Waste Handling and Separation, Storage and Processing at the Source.

Waste handling and separation involve that activities associated with Management of wastes until they are placed in storage containers for collection.

Handling also include the movement of loaded containers to the point of collection.

The best place to separate waste material for reuse and recycling is at the source of generation. Why??

On-site storage is of primary importance because of public health concerns and a esthetic consideration

Processing at the source involves activities such as compaction and yard waste composting.

Collection not includes the gathering of solid waste and recyclable materials, but also the transport of these materials to the location where the collection vehicle is emptied.

This location may be materials processing facility, transfer station or land fill disposed site.

Different between small cities and Large cities (how?).

Show Table 1-1

50% of the total annual cost of urban S.W.M due to collection.

Collection services for industries vary widely (why?).

Each industry requires an individual solution to its waste problems.

Separation, processing and transformation of SW:

The separation and processing of wastes that have been separated of the source and the separation of commingled wastes usually occur at:

1- Materials recovery facility
2- Transfer stations
3- Combustion facilities
4- Disposal sites.

Processing often includes:

1- The separation of bulky items
2- Separation of waste components by size using

Screens, manual separation, size reduction by shredding, separation of ferrous metals, volume reduction by compaction and combustion.

Transformation processes are used to

- Reduce the volume and weight of waste
- Recover conversion products and energy

Organic material in MSW can be transformed by variety of chemical and biological processes such as combustion and composting

Transfer and transport – involve two steps

1- Transfer waste from the smaller collection vehicle to the larger transport equipment
2- The subsequent transport of the wastes usually over long distances to processing or disposal site.

Disposal

The final fictional element in the S.W.M. system is disposal

A modern sanitary landfill is not a dump it is engineered facility used for disposing of SW on land with out creating nuisances or hazards to public health or safety. Such as the breeding of rats and insects and the contamination of ground water.

1-4 Integrated Solid Waste Management

ISWM can be defined as the selection and application of suitable techniques, technologies and management programs to a chives specific waste management objectives and goals.

The ISWM hierarchy in USA is

1- Source reduction

2- recycling

3- waste combustion

4- land filling

The ISWM hierarchy in this book is

1- source reduction

2- recycling

3- waste transformation

4- land filling

Source Reduction

The highest rank at the ISWMH

Source reduction involves reducing the a mount and toxicity of the wastes that are now generated.

Source reduction is the most effective way to reduce

1- The quantity of waste
2- The cost associated with its handling
3- The environmental impact

waste reduction may occur

1- Through the design
2- Manufacture
3- Packaging of products with minimum toxic content minimum volume of material or longer useful live

waste reduction may also occur at

1- Household
2- Commercial facility
3- Industrial facility

Recycling

The second highest rank in the hierarchy is recycling, which involves

1- The separating and collection of waste materials
2- The preparation of these material for reuse, reprocessing and remanufacture.
3- The reuse, reprocessing and remanufacture of these materials.

Waste transformation

The third rank in the ISWMH and it involve the physical, chemical or biological alteration of wastes.

The physical, chemical and biological transformations that can be applied to MSW are used to

1- Improve the efficiency of SWM
2- Recover reusable and recyclable materials
3- Recover conversion products (compost)

The transformation of waste usually results in the reduced use of landfill capacity. (combustion)

Landfilling use for

1- Wastes that cannot be recycled
2- The residual matter remaining after separated and recovery facility

3- The residual matter remaining after the recovery of conversion products or energy

Landfilling is the lowest in the ISWMH because it represents the least desirable means of dealing with so cite wastes.

Planning for Integrated Waste Management

Developing and implementing an ISWM plan is essentially local activity that involve: Selection of the proper mix of alternative and technologies to meet changing local waste management needs while meeting legislative mandated.

Proper Mix of Alternatives and technologies:

A wide variety of alternative programs and technologies are now variable for the SWM

Several questions arise from this variety

1- What is the proper mix between:

A. The amount of waste separated for reuse and recycling

B. The amount of waste that is composted

C. The amount of waste that is combusted

D. The amount of waste that to be disposed of in landfills.

2- What technology should be used for collecting wastes separated at the source for separating waste components at materials recovery facilities (MRFs)

3- What is the proper timing for the application of various technologies in an ISWM system and how should decisions be made?

Note:

Because of the wide range of participants in the decision making process for the implementation of SWM systems, the selection of the proper mix of

alternatives and technologies for the effective management of wastes has become a difficult. If Not impossible task

The development of effective ISWM system depends on:

1- Availability of reliable data on the characteristics of the waste stream
2- Performance specifications for alternative technologies
3- Adequate cost information.

Flexibility in Meeting Future changes

Some factors to consider include

1- Changes in the quantities and composition of the waste stream
2- Changes in the specification and markets for recyclable material
3- Rapid developments in technology.

Monitoring and Evaluation

ISWM is an ongoing activity

1-5 Operation of Solid Waste Management Systems.

The facilities that compose SWM system are often identified as solid waste management system units.

The planning and engineering of SWM units include social, political and technical factors.

The combination of all of these factors forms a series of issues

Management Issues

Setting workable but protective regulatory standards

Improving scientific methods for interpretation data.

The goal is to understand the effects of very small quantities of toxic components on the environment.

Identification of hazardous and toxic consumer products requiring special waste management units.

Paying for improved waste management units (Fig 1-6)

Designating land disposal units at or near large urban centers

The issues are identifying environmentally acceptable land areas for land disposal units and then preserving lands for the intended use.

Who will set a standard for environmentally acceptable?

Will different standards apply for urban and rural areas?

Can a scientific basis be identified that will satisfy a suspicious public regarding the safety of land disposal units?

Establishing and maintaining more qualified managers to develop and operate waste management Units.

Future challenges and opportunities

Changing consumption habits in society

Reducing the volume of waste at the source.

Making landfills safer (short and long term)

Development of new technologies.