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CASE STUDY GARBAGE MOUNTAIN (Puente hill, California)

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ABSTRACT

In highly populated countries more garbage waste is produced but for the disposal of this garbage waste landfill method has to be used but it's not give good result as expected. So, garbage mountain method is beneficial for disposal of garbage waste than the landfill. Garbage mountain helps to avoid the problems occurs in landfill method like leachate, soil contamination, bad odor, ground water problems. Biogas produced from this method can be used for human needs also this method is non-hazardous and does not release any poison gases. After complete disposal of waste same land site can be used for different purposes like agricultural or gardening etc.

Keywords*: Garbage Mountain, Leachate, Landfill*

I. INTRODUCTION

As the human race has evolved it has adopted to the life of technology, luxury and comfort. But with such a life comes the needs and so called sophistication. This gets to increase the daily production of garbage. This garbage is having very hazardous to living as well as non-living things. For the disposal of the garbage waste so many different types of methods are used like landfill, composting, biogas, combustion etc.

But from these methods are having so many drawbacks like air pollution, soil pollution and water pollution.

"Two hundred eight million, two hundred nine million…"That is the value of solid waste of garbage form, all over the United States in 1996.
In 1989, the garbologist Bill Rathje investigate the fresh kills landfill on sustain Island New York (3000 acre) for knowing the behavior of decompose disposal garbage waste and he found that a 36 years old newspaper in preserved in readable condition because of lack of oxygen for decomposition that's why the garbage mountain is the best option than landfill.

Introduction Of Puente Hill
Country: United States State: California
District: Los Angeles County
Range Coordinates: 33º59´59´´N 117º55´33´´W USGS La Habra
The Puente hills the chain of the hill and its western ends of the range is often referred to locally as the Whittier hills.

Location: Puente Hills Los Angeles (+60 miles), California, America.
1400 acres including dam site, material recovering facility and power plant.
Quantity of waste dumping: Consumes about 13000tons of municipal waste, 900tonnes of asphalt, >100000tons of green waste, 700tons of ash in each day. These total waste are enough to fill the roosebolt stadium in just a 13 days.

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Fig.1.Map of the Puente hills landfill

While selection of the site they select the Puente hill mountain and dug it from two adjacent side and make it as base or support to the garbage mountain and also digging material can be used in garbage mountain construction for layer of covering on garbage.

II. PROCESS OF CONSTRUCTION OF GARBAGE MOUNTAIN

In formation garbage mountain followings steps involved:

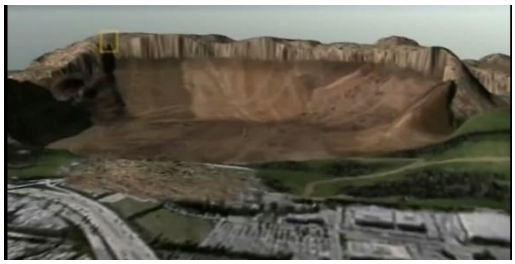

Fig.2.formation of base

A. Barrier

In garbage there some liquid substances which when mixed can get quite toxic. This toxic waste or Leachate percolates down. The barrier is a layer of impervious plastic (Polyethylene) laid between the garbage and the ground. This layer keeps the leachate from seeping down to the ground water and contaminating it. The plastic is tightly woven and thick enough to block large quantities of leachate.

Procedure

Shape and design of operating area is dug out.
The walls and floor is covered with alternating layers of clay, sand and drainage material.
Then the area is wrapped up in polyethylene plastic.

Functions

To seal off the waste from ground and prevent any contamination.
It keeps the leach ate together for conveyance to the water treatment plant.

Advantages

The plastic does not decay as the garbage and thus is durable for as long as the project is active.

B. Drain

keeping the leachate is not enough to avoid the contamination. The water has to be collected and disposed. This is achieved by providing a drainage system just above the barrier.

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Procedure
Perforated pipes are laid over the barrier parallel to each other. These pipes are connected to the water treatment plant.

Function
To collect and transport the leachate to the water treatment plant.
To lower the moisture level at the bottom of the mountain.
Ensuring the water does not spill out the bottom of the project.

Advantages
The contamination is more effectively avoided.

C. Lying of the pipes in the layer of the garbage

The gas are generated during the decomposition of the garbage cannot be left out consideration. This gas harmful to the atmosphere and nearby resident. This gas are collected by providing the pipes between the garbage layers in four stage system.

Fig.3.laying of pipes in layer in four stage system

Procedure
After a cell is prepared, part of it carefully dug out. This is where the pipes go, Even the laying of pipe is systematic. Two pipes of different sizes are used. The smaller sizes pipe inserted up to a hand length into the lager one when laying in ditches. This way the system remain flexible. If there is differential sagging the pipping doesn't break off. This pipes are sealed. Instead gravel is poured around them. This is done so that there are no blockage to the pipping and still there are many inlets available as possible. The gravel is used because it doesn't keep obstruction to the gases from entering pipes.

Function
To collect and convey the gases generated during decomposition of the waste.
To provide a means to supply oxygen to the deeper part where the decomposition is slow due to lack of it.

Fig.4.laying of pipes in layer in male female system

Advantages
The gapes at the intersection are used as the inlet for the gasses which can be used for public or industrial used. More flexibility to the pipe line. There is no damage to the pipeline from differential settlement. Can be transport gases over a long distant

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D. Soil cover

A layer of the garbage are covered with the soil for the decomposition which helps in effective decomposition and also provide the impervious layer to the rain water. These soil layers are make different layers of the garbage. Soil also prevent the layers from the scavenging bird.

Procedure

Application of the garbage layer is done then after the garbage layer vegetated soil is applied on the garbage layer.After this the compaction is done for the good compaction some proportion of water is spread upon the soil layer.

Function

Provide the impervious layer to the rain water.
Also act as barrier to the gases which are generated after the decomposition of garbage layers.Provide the best to the next layer.

Advantages

Barrier to the gases.Compaction of the garbage layers becomes more effectively.

III. CONSTANT MONITORING

Measures are taken so that there are no leakage and contamination. However, no precaution is full proof. There is need to constant monitoring to keep a tap if there is any leakage.

Procedure

Monitoring units are placed on the pipes carrying leachate to the water treatment plant. A regular data is kept of the components of the leachate and the surrounding ground water. If the components are similar in nature there is leakage in the drain and barrier which can be catastrophic.

Function

To keep a tab on the leakage.
The data details give an idea as to what treatment is needed.

Advantages

To know the total toxic wastages.
Knowing amount of toxic wastages.
Because of this we known the treatment to given to that toxic waste.

IV. SORTING UNITS

In sorting unit sorting of wastage can be done. Not all of the wastage that comes can be used for the dumping facility. Also there are some materials that are better reused than away to rot. In sorting units materials ae sorted out by there properties.

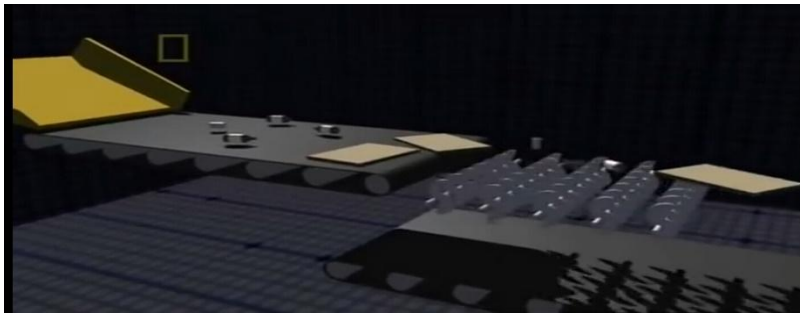

Fig.5.sorting units

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Function
Ensuring that little or no decomposable material is fed into the dump.
Keeping harmful waste out if the dump. Giving a general idea of the habits of locals.

Advantages
There is no saturation of indecomposable materials.
Harmful medical and electronic waste is collected and disposed of separately.
Recycle material can be sorted out.

V. CLOSING DOWN OF THE GARBAGE MOUNTAIN:

Procedure:

a) A two feet layer of soil put and compacted over all the garbage.
b) Good compaction is done.
c) A layer of sandy soil is applied on it.
d) A feet of clay soil to form it as a water tight layer.
e) Surface is then tested to see the stable moisture content to confirm the layer stability.
f) The final step is a layer of vegetation soil on it.

VI. POWER GENERATION BY GARBAGE MOUNTAIN:

The land fill receives 1200 tons of the waste per day. The part of the land fill is already closed and producing 27000 to 28000 CFM gas with the typical composition of 36-40% methane, 35% CO_2,5% O_2 and 90-100 ppm H_2S. The gas collected from the land fill is delivered to the Puente hills energy recovery facility, where it is burn in a boiler to produce a steam which is feed to the a turbine generator set (Two steam boiler each of rating of 264000 Ib/hr. @ 1000ºF and 1 turbine of 1850 Ib/hr.)The power generation is closed to 50 MW which makes it the largest landfill gas to energy facility in the world.

The operation report of the energy recovery facility for the month of March 1997.Gross power: 37766000KW/Hr.Parastic Power: 2832000KW/Hr.Net Power: 34934000 KW/Hr.Net Average: 47000KW/Hr.Average LFG Used: 23800 SCFMAvailability: 100.0%Capacity Factor: 101.5%Dispenser Availability: 100.0%Solar On line: 87.0%

The net energy generation and the total income during the year 1993-1996 as follow,

Table No.01 Net Energy Generation And Total Income

Year Total Income ($) (Approx.)	Total Net KW/Hr.
1993	49219330 394 MU
1994	52445031 394 MU
1995	56276480 397 MU
1996	60235255 480 MU

They also have the producing CNG 100cfm of high quality. CNG containing on average 97.5% methane.In this facilities methane gas coming from landfill is dewatered purified by membrane purification technology which requires minimal maintenance and pressurized to produce high quality CNG.The total project cost of this component was approx. US$ 1 million. The facility is projected to be capable of producing clean fuel at an equivalent gasoline cost in range of US$ 0.5-1.0 per gallon.

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VII.CONCLUSION

Fromthis review paper we conclude that garbage mountain is the advanced process to the landfill which having more advantages than landfill and also having less environmental problem. It is good process for getting the revenue from garbage and it requires less land for process .also study the about the detail of garbage mountain Puente hill.

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