AN EXPERMENTAL MODEL DESIGN DEVELOPMENT STUDY FOR COLLECTION OF SOLID WASTE FROM DRAINAGES

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ABSTRACT:

Today's world is dealing with many serious problems, few among which are caused by solid waste. These solid wastes are a hindrance to the public – they block drainage lines and are also responsible for death of many living beings. It also causes a huge amount of pollution, destroying elements of nature like soil, water and air. The solid waste produced is blocking the drainage lines which results in larger catastrophes to human life and is also becoming a life threat to the animal life at far ends. To deal with such calamities, one of the best methods is to separate solid waste from drainage systems at the initial stages. This solid waste is classified into two type's i.e. organic and inorganic wastes. These organic wastes can be separated and treated to generate bio gas and electricity. But the inorganic solid waste is capable of polluting the nature for long time and also choking animals to death. We came up different techniques which can eliminate solid wastes at initial stages and compare the efficiency of the techniques to recommend the suitable technique for different conditions.

1. INTRODUCTION

1.1 NEED FOR THE STUDY

The increase in population and urbanization in India have elicited a tremendous effect on drainages in cities. In the present day scenario, solid waste is found in almost every small water-body which has become a concentrated problem to the environment and society. This is also becoming a life threat to the aquatic life. If this is reduced at this level eventually the solid waste would be reduced at the far ends of the water bodies. This waste, as name suggests, is solid and hard to clean from the water at the end part. To minimize this effect of

increasing solid waste, it is better to stop it at the elementary levels viz., cleaning the waste at its initial levels to ensure the better drainage conditions.

Solid wastes are differentiated into organic and inorganic wastes where organic waste which can be treated and consolidated without any harmful effects. But the inorganic wastes like plastics, which can't be disposed off easily are considered to be the major issues. These solid wastes are blocking up the drainage lines which results in increase in pressure in drainages and finally decreases the performance and life of the drainage lines. At the far ends, these solid wastes are dumped in the waters resulting in asphyxiation to the water animals and death. This is also becoming one of the reasons in the loss of few aquatic species which are on the wedge of the extinction.

1.2 DRAINAGES:

Around the world people are following different drainage system among which two techniques are predominantly used. They are:

1.2.1 Combined drainage systems:

The countries which follow this system will be planning the drainages to hold both storm water and sewage water together. This reduces drainages lines. This technique requires large dimension drainage lines. In this combined drainage system both storm and sewage water are blend together where all the storm water is going in vain. When the rains hit the cities and drainages aren't maintained properly, it results in breakage of drainage lines and flooding of roads which finally results as hindrance to the public. And in summers as the drainage line dimensions are high there might be a chance of stagnation of waters which generates foul odours around the place.

1.2.2 Separate drainage systems:

Most of the developed countries are following separate drainage systems. This technique help in collecting storm water and prevent it from wasting by maintaining storm water drainages separately on the surface. The sewage drainage systems are followed separately with an underground lining. This avoids flooding of roads and can also have fewer dimensions of the drainage lines.

1.3 SOLID WASTE:

Solid waste is produced by the humans in order to fulfil their needs. This solid waste generated is dumped on the bare lands, which is capable of polluting the soil and air. It is

also acting as breed hub for the parasites which are capable of infecting people with new diseases. Due to improper disposal it is turned out to be a huge problem when it is merging with drainages. As the name suggests, all the solids block the flow of drainage sewer waters which creates a huge problem. The solid waste is categorized into the following types:

1.3.1 Organic Solid Waste:

The waste produced by man, which has organic matter is called organic solid waste. This type of waste usually comprises food, fruit peels, and all other organic matters which are easily degradable. This solid waste plays a vital role in breeding parasites yet they are easily decomposable.

1.3.2 Inorganic Solid Waste:

The waste produced by man, which has inorganic matter is called inorganic solid waste. This type of waste usually comprises of plastics, metals and other composite materials which are not easily degradable. They emit harmful gases on burning. They are hardly decomposed when left. They are becoming a life threat to many animal species.

1.4 OBJECTIVES

- To design the appropriate mechanism or technique to reduce the solid waste in the waters.

1.4 DESCRIPTION OF STUDY AREA:

Study area: Satyanarayanapuram

City: Vijayawada

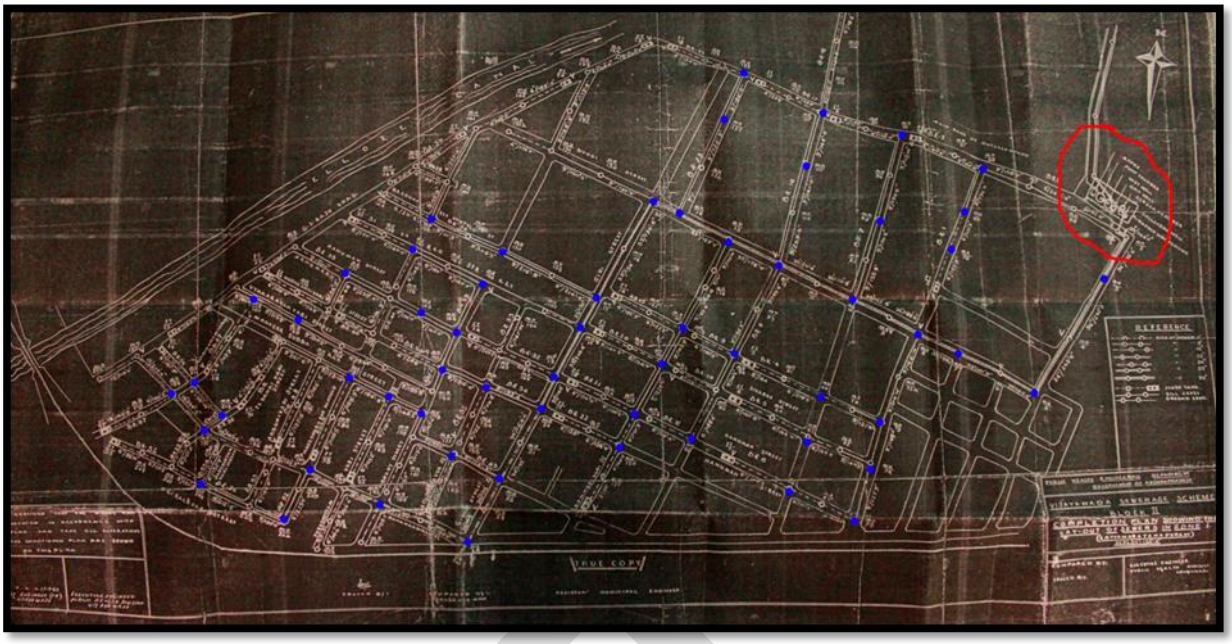
State: Andhra Pradesh

Country: India

The study area is taken into consideration in order to study the adaptability of the techniques to the real life situations and to know the pros and cons. In this study area, only the drainage patterns are taken into consideration as per the need. The current drainage system being followed is designed 50 years ago and it is a combined drainage system. The dimensions of the drainages are as follows:

Trunk line: 36 inches diameter at the end of the trunk line where it meets purifying plant

33,30,24,18 inches diameter lines as it start splitting and branching.Branch lines: 9 inch and 6 inch diameter lines are laid.



2. METHODOLOGY

Existing drainages are vulnerable to the blockages caused due to solid wastes hence it is mandatory to segregate the waste at initial stages .The problems caused by drainages bring the urge of adopting apt technique for the current conditions of drainages to eliminate the solid waste. Two techniques are developed based on the factors influencing the drainage efficiency.

2.1 METHOD 1:

- To study the conditions of current drainage systems.
- To study the design parameters of the drainage systems.
- To estimate the amount of solid waste being produced and channelized through drainages into water bodies.
- The setup comprises a Bin, a mesh and a pipeline.
- On the whole, the *bin* is immersed into the water with a *mesh* in it. The *pipeline* is connected to the bin from its bottom and the other end will be our required output viz., pure water. To obtain pure water a motor is connected at the end of the pipeline.

2.1.1 BIN:

The hollow cylinder with opening at one end, a small hole at the other end. This cylinder is made of stainless steel. A clean figure is shown in Fig: 1

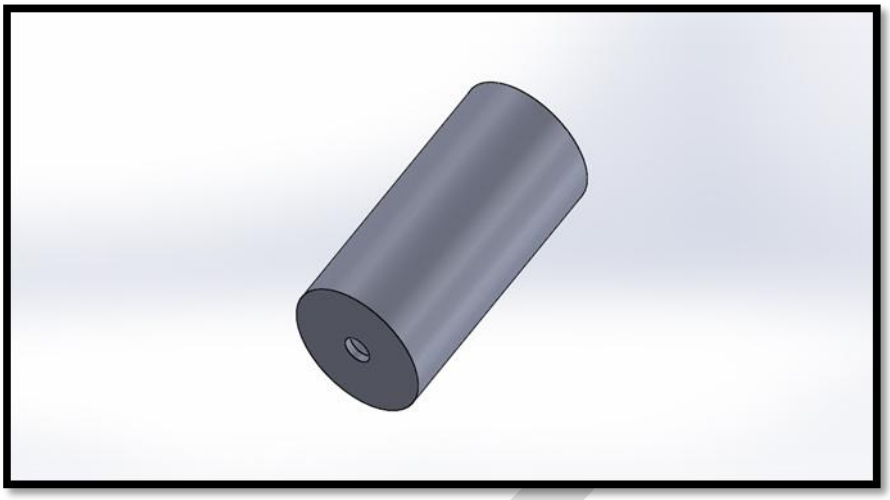


Fig: 1 Bin

2.1.2 MESH:

A net is placed in the bin with a smaller dimension than bin so that the net fits in the bin. This net is perforated with small holes in order to escape the waters and trap the solids. The hole dimension must be altered as per the minimal size of the solid waste which can block the drainages.

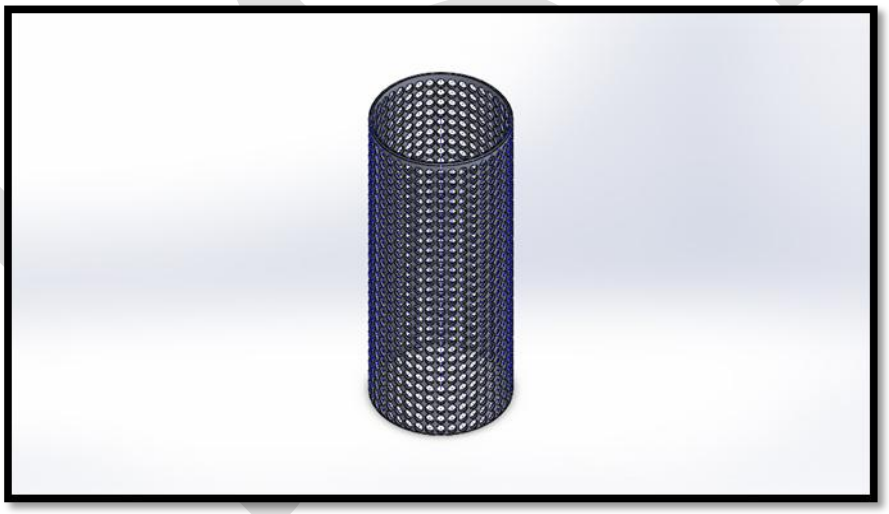


Fig: 2 Mesh

2.1.3 COMPLETE SETUP:

The complete setup comprises of a bin, mesh and a ‘z’ section pipe which helps in escaping water with the help of pumping. The ‘z’ section pipe is made of stainless steel.

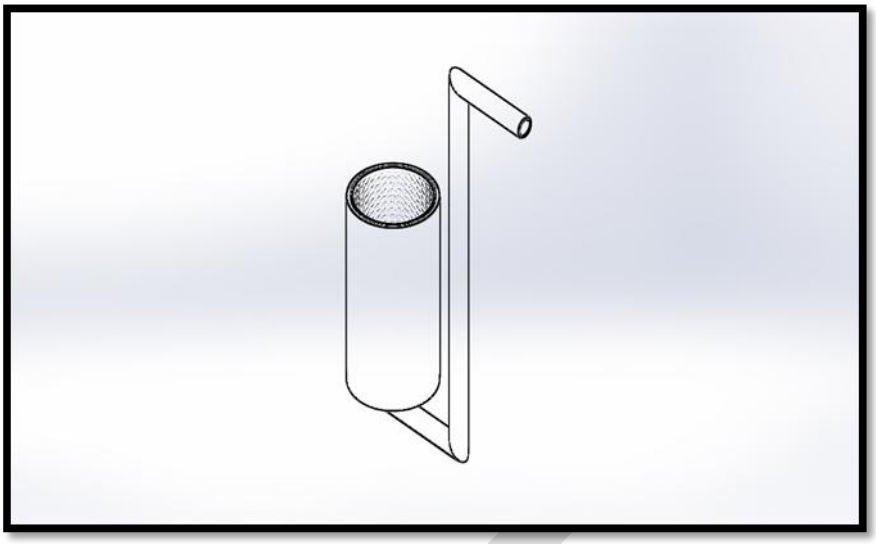
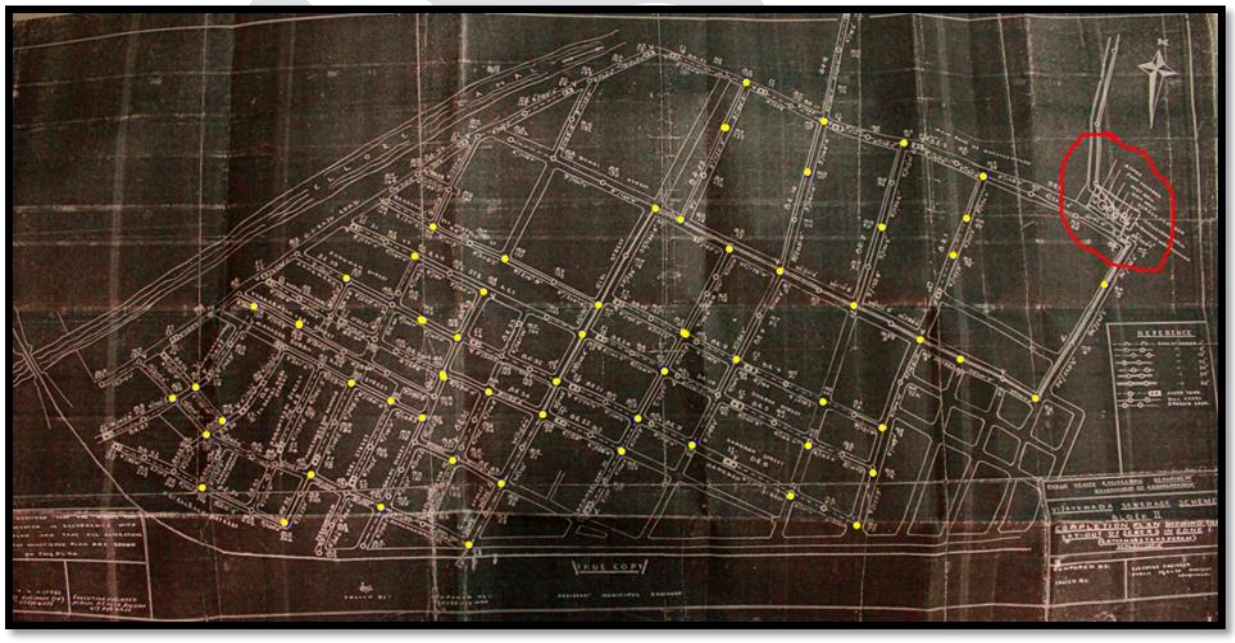


Fig: 3 complete setup

The below image gives the information regarding the drainage lines of th study area considered and the preferable points to plant the bins. The dots in the image explain the placing of the bins at the drainage lines.



Study Area – planting bins

2.2 METHOD 2:

- In this method, the solid waste is separated and directed to incineration tank, where all the solid waste is burnt into ashes.

- At the end of the trunk line which is directed to the purifying plant is manipulated by a propeller at a junction so that all the solid waste is directed to another line which is connected to incineration tank.
- The wastes produce harmful gases on burning, which are again directed back to the drainage waters, as they are to be processed further.
- The ashes which are formed can be used as filler materials in the constructions.

2.2.1 DESIGN OF PIPE LINE:

As the solid waste should be directed to another channel a 'Y' section channel is placed at the junction point. At this junction an appropriate propeller is placed perpendicular to the flow in order to separate the waste from flow. Fig 4 and Fig 5 explains the section of the pipe.

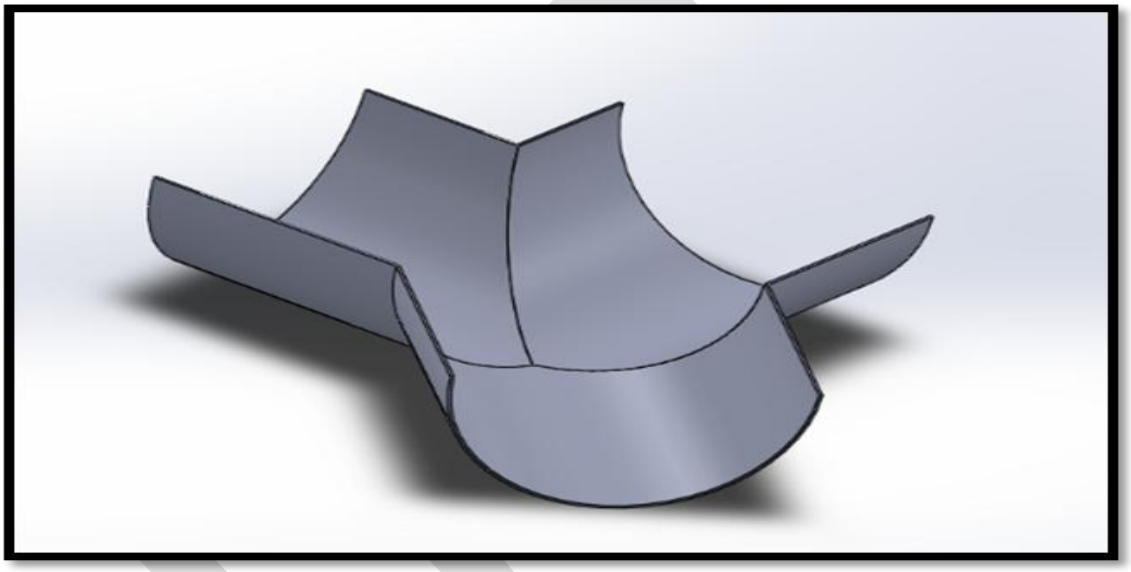


Fig: 4 cross section of Y-section pipe

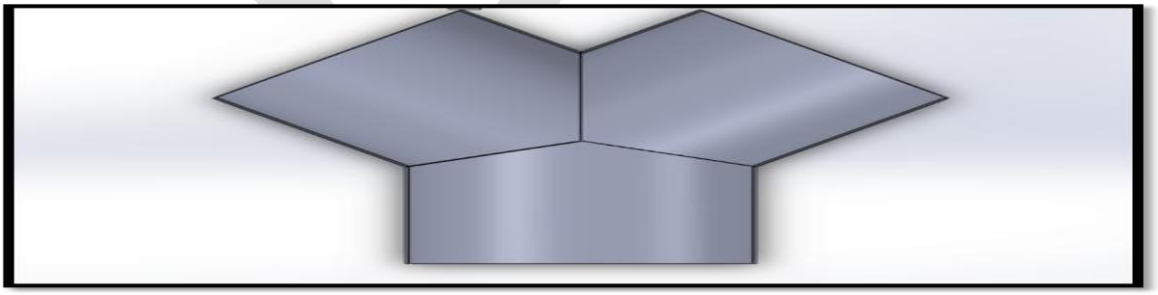


Fig: 5 top view of y- section pipe at the end of trunk line to deviate solid waste.

2.2.2 PERFORATED PROPELLER:

The propeller is used in this method is a unique propeller whose fins are perforated. This typical type of propeller helps water to escape and solid waste to deviate from the main drainage trunk line. Fig:6 shows the design of the propeller.

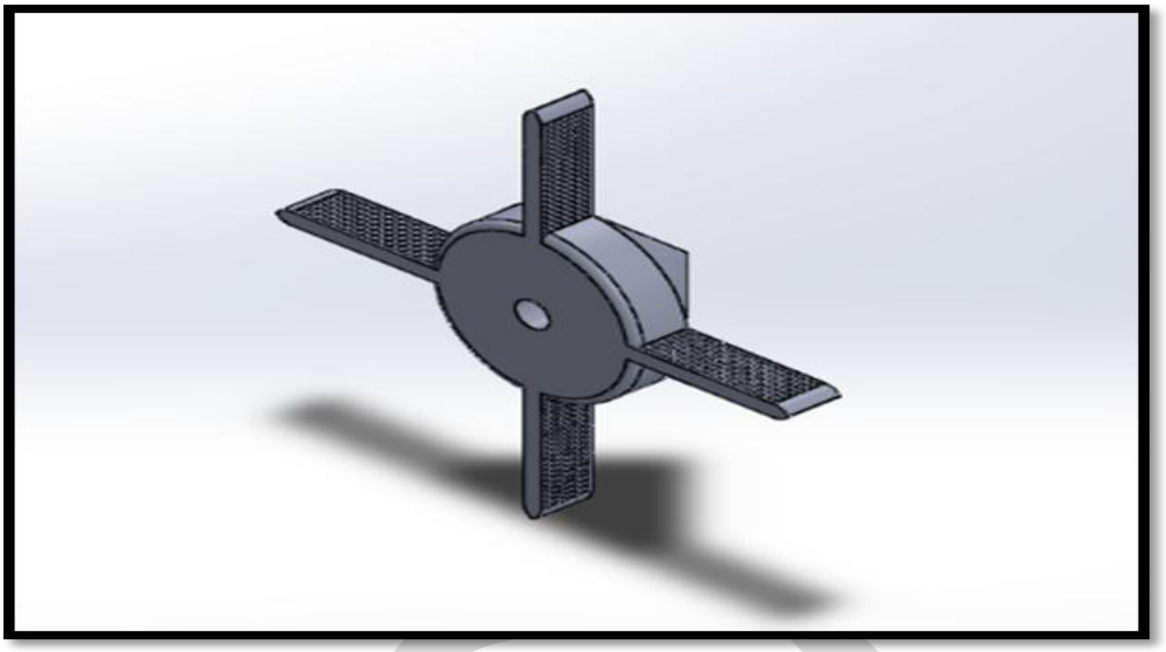
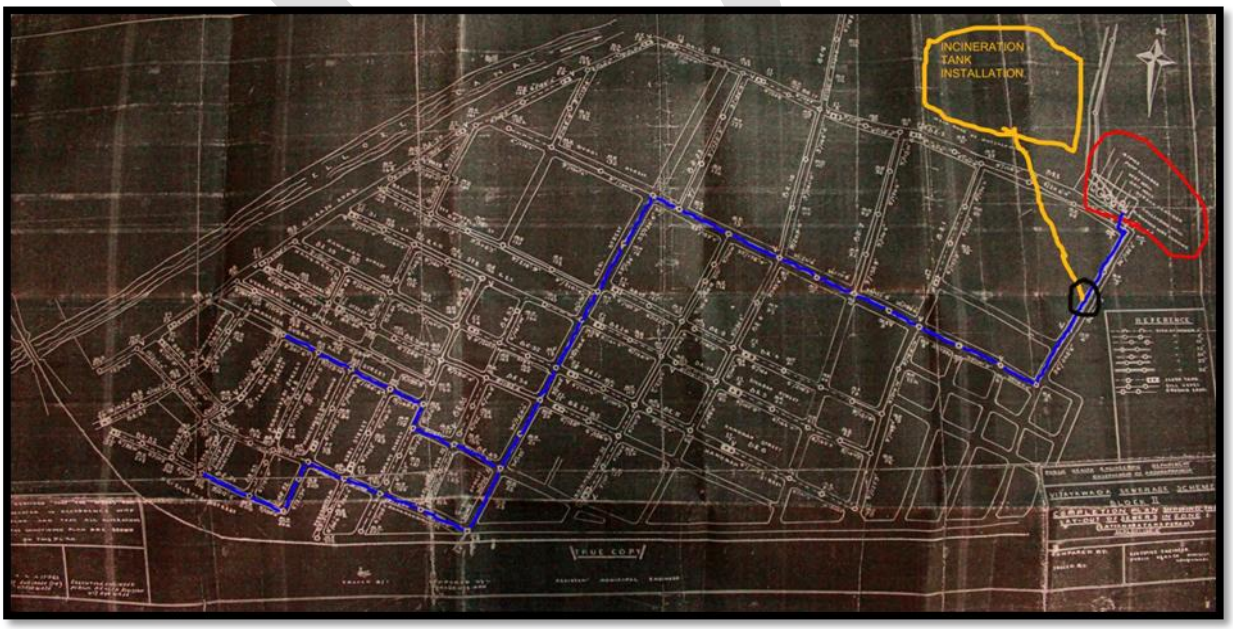


Fig: 6 a perforated propeller to segregate solid waste.

The below image depicts the idea of the incineration plant



Study Area- deviating solid waste to incineration tank

3.RESULTS AND DISCUSSION

On keen observation on the study area and with practical inspection of the drainage systems being followed, the following differentiation is made.

METHOD-1	METHOD-2
This technique requires very frequent inspection to empty the bins time to time.	This technique requires frequent inspection at the time of incineration process
Solid waste collecting capacity is low	Solid waste collecting capacity is high
Should be installed at regular intervals	Can be installed at the end of trunk line. No additional interventions.
The collected solid waste should be collected and dumped at a dumping zone using a truck.	The solid waste is burnt to ashes which are used again as a filler material in constructions.
Installation is cheap.	Installation is costly.
Can be adopted foe small areas or rural areas.	Can be adopted in urban areas.
Mostly likely not preferable for huge areas.	It is not preferable at areas where waste generation is low.
Man power required is less.	Man power required is more comparatively.
Consumes much electric power	Consumes less electric power comparatively
Maintenance is low.	Maintenance is high.

- Method-1 can be recommended at areas where solid waste generation is less. (gated communities, certain industrial areas, rural areas)
- Method-2 can be opted at urban areas where solid waste generation is high.

REFERENCES

(1) SEWER SIPHONS AND ODOR CONTROL: A PRACTICAL APPROACH by DAVID BENNETT.

(2) IMPROVEMENT OF STORM WATER DRAINAGE SYSTEM IN GREATER HYDERABAD MUNICIPAL CORPORATION by C.Sarala, G.SreeLakshmi. **International Journal of Advances in Engineering & Technology**

(3) ENVIRONMENTAL AND SOCIAL IMPACT DUE TO URBAN DRAINAGE PROBLEMS IN DHAKA CITY, BANGLADESH by MD. MASUD ALOM, MD. ZAHID HUSAIN KHAN. **International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-3 Issue-6**

(4) ASSESSMENT OF SOLID WASTE MANAGEMENT PROBLEMS IN COLLEGE OF EDUCATION, IKERE – EKITI, EKITI STATE, SOUTH WEST NIGERIA by

IKUDAYISI, AKINOLA MAYOWA AND GBENGA ARIBISALA. **Scholarly Journal of Education Vol. 1(4), pp. 42-45**

(5) SOLID WASTE MANAGEMENT IN KENYA: A CASE STUDY OF PUBLIC TECHNICAL TRAINING INSTITUTIONS by N. K. GAKUNGU, A. N. GITAU. **ICASTOR Journal of Engineering, Vol. 5, No. 3 (2012) 127 – 138**

(6) APPRAISAL OF MUNICIPAL SOLID WASTE MANAGEMENT, ITS EFFECT AND RESOURCE POTENTIAL IN A SEMI-URBAN CITY: A CASE STUDY by DAVID O. OLUKANNI, OLADIPUPO O. AKINYINKA, ANTHONY N. EDE, ISAAC. I. AKINWUMI AND KOLAWOLE O. AJANAKU. **Journal of South African Business Research, Vol. 2014 (2014), Article ID 705695, 13 pages**

(7) AN ANALYSIS OF SOLID WASTE GENERATION AND DISPOSAL IN DUTSE SAHELIAN ZONE OF JIGAWA STATE, NIGERIA by AMINU MANSUR. **International Journal of Agriculture and Crop Sciences, IJACS/2015/8-2/81-85 ISSN 2227-670X**

(8) SOLID WASTE COLLECTION AND SEGREGATION: A CASE STUDY OF MNIT CAMPUS, JAIPUR by VIPIN UPADHYAY, JETHOO A.S, POONIA M. P. **International Journal of Engineering and Innovative Technology (IJEIT), Volume 1, Issue 3**

(9) MANAGEMENT AND DISPOSAL OF MUNICIPAL SOLID WASTES IN ABAKALIKI METROPOLIS, EBONYI STATE, NIGERIA by PATRICK AKATA NWOFE**. International Journal of Scientific Research in Environmental Sciences, ISSN: 2322-4983;**

(10)WASTE MANAGEMENT TOWARDS SUSTAINABLE DEVELOPMENT IN NIGERIA: A CASE STUDY OF LAGOS STATE by ADEWOLE, A. TAIWO. **International NGO Journal Vol. 4 (4), pp. 173-179, ISSN 1993–8225 © 2009**