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Design Of Model To Collect The Solid Waste And To Produce The Methane Gas In Bin Over A Period Of Time

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Abstract: *The handling of municipal waste is one of the most difficult Task so the model is design to Reduce the work load of municipal council and to reduce the epidemic diseases. The waste from household will be collected and waste will be pre-treated for the decomposition, then the waste will be transferred to the design bin. The amount of water will be kept in different proportions to test the gas production. The collected waste is properly blended with cow dung and other waste materials that is grass, papers, glass, rubbers, leather, woods, dust etc. the decomposition takes place in mainly by anaerobic process consist of four steps, a) hydrolysis b) acidogenesis c) acetogenesis d) methanogenesis. After certain days it produces methane gas. The produced methane gas consists some impurities, which is then check for quality. The by-product of this process is manure, which also tested for quality and it is used for agriculture as natural fertilizer. We are finding the amount of CH_4 gas production for different rate of water.*

Keywords: *Solid waste, Methane gas, Anaerobic digestion, Fluid dynamics and Tyre tube.*

I. Introduction:

Solid waste disposal has particular has become a daunting task for municipal authorities. This model engaged households that demand the services of solid waste management within the area. The management of solid waste has attained highest importance in this globally but the practices of basic concepts on waste disposal are often neglected. The environment we live is provides support for our survival as well as other living things. globally effects are being made to make people aware about the need to protect the environment. Human activities create waste and this waste are handled, stored, collected and disposed off, which can pose risk to the environment and to the public. Economic development, urbanization and improved living standards in cities increase the quantity and complexity of generated solid waste. In discussing solid waste, generally and traditional certain categories of wastes are well recognized as they are very common. For example, the solid waste include domestic, commercial, industrial, agricultural, institutional and miscellaneous. Many times domestic and commercial waste cannot be differentiated and are considered together as urban waste.

Municipal solid waste is generally a combination of household and commercial refuse which is generated from the living community. The continous indiscriminate disposal of municipal solid waste is accelerating and linked to poverty, poor governance, urbanization population growth, poor standard of living low level of environmental awareness and inadequate management of environmental knowledge solid waste management is one of the major environment problem of Indian cities. Improper management of municipal solid waste cause hazardous to in habitantsmunicipal solid waste management solution must financially sustainable, technically feasible, socially. legally acceptable and environmentally friendly. Solid waste management is biggest challenge to the authorities of both small and large cities

II. Benefits Of Solid Waste Management:

Now a day's greater attention is being paid to waste management, and pro-active organizations are seeing the benefits of establishing a waste reduction programs.

- Save money:- Increasing recycling can cut your disposal costs and improve your bottom line.
- Knowledge is power:- By understanding the amount and types of wastes your organization produces, you're better positioned to find ways to reduce hauling costs and negotiate for waste and recycling services that actually fit your needs.
- Streamline reporting and information sharing:- Tracking your waste management activities in one platform and using a standard set of metrics, makes it easier to share and report information with stakeholders.
- Enhance sustainability:- Managing waste, water and energy more efficiently are core components of sustainability. Improving your organisation's sustainability can boost your corporate image, attract quality tenants to your properties and positively engage employees.

- Reduce greenhouse gas emissions:- waste prevention and recycling offer significant potential for reducing greenhouse gas emissions.
- Conserve resources: - Reuse and recycling conserve natural resources including trees, metals and water.

USES OF METHANE GAS:

- **Used in cooking:**

Methane is a hydrocarbon and lighter than air. Therefore, it produces more energy per unit weight in comparison to oil and coal. It is also used for cooking since it does not have any smell and does not leave soot on the cooking utensils.

- **Used to provide lighting:**

Methane gas can be harnessed to generate electricity for homes as well as offices and industries.

- **Used in production of other components:**

Methane gas is essential for the formation of methanol (methyl alcohol), which is a key component of alcohol. It is also important in the artificial manufacture of hydrogen to be used in various industries.
Hydrochloric acid, one of the most common acid used in laboratories, is manufactured with methane gas as an ingredient.

- **Used to run industrial machineries:**

Methane gas is used to run or power engines and turbines in factories. It is also used to provide energy for lightening purposes.

- **Used to produce carbon blocks:**

Methane gas can be burned incompletely leading to unusual carbon deposits. These deposits are known as carbon black and are used to strengthen rubber which is used to make rubber tyres. This same carbon black is used to make paints and printing ink.

- **Used in manufacture fertilizer ingredient:**

With the addition of hydrogen, methane gas is used to manufacture ammonia, which is a key compound in the manufacture of fertilizer.

- **Used as rocket fuel:**

Its gaseous state translates to less carbon deposits when combusted, making it ideal for rocket fuel. It also leaves no residue. Other forms of fuel such as kerosene emit a lot of carbon, making the rocket combustion chamber faulty.

III. Materials Used

Materials used for construction of model are,

I. **WATER CAN (20L):** This is used for the collection of materials and for the• purpose of storage.

A watering can is a portable container, usually with a handle and a funnel, used to water plants by hand. It has been in use since at least 79 A.D. and has since seen many improvements in design. Apart from watering plants, it has varied uses, as it is a fairly versatile tool.

II. **ELECTRICAL PIPE**: This is used for the purpose of smooth flow of gas,produced from the Water can to the collector tyre tube.

Properties of electrical pipe:

- **Ductility:-** tough, PE conduit will better resist brittleness with age or coldweather**.**

- **Low temperature impact resistance:–** PE withstands low temperature¬ impact better than any other material. This is illustrated by impact testing on PE conduit conditioned at 4ºF as compared to other materials conditioned at 73^0 F**.**
- **Permanent flexibility:–** PE conduit bends and flexes without breakage, even¬ with ground heaves or shifts, over a wide range of temperatures.
- **Temperature versatility:–** PE conduit can be installed over an ambient¬ temperature range of -30ºF to 180ºF. Power conductors rated at 90ºC and medium voltage cable rated at 105℃ is permitted for use with PE Conduit.

III. **PVC BALL VALVE:** Valve is a device that regulates, directs or controls the flow• of fluids by opening, closing or partially obstructing various passage ways. In an open valve fluid flows in a direction from higher pressure to lower pressure. This is used to control the flow of gas from water can to the collector tube.

Properties of ball valve:

- Ball valves are durable, performing well after many cycles, and reliable,¬ closing securely even after long periods of disuse.
- These qualities make them an excellent choice for shutoff and control¬ applications, where they are often preferred to gates and globe valves, but they lack their fine control in throttling applications.
- The ball valve's ease of operation, repair

TYRE TUBE: this is for the purpose of collecting the gas and storing it without the leakage.

Care and Maintenance of tyre tube:

- Whenever a tyre is to be demounted from a wheel or prior to mounting of a¬tyre, the condition of the rim / wheel should be checked thoroughly, particularly for any distortion of the rim flange or wheel disc. Any rust is to be removed by brushing off with a wire brush.
- Damaged, cracked or distorted wheels, or wheels having stud hole seating¬ cracked or deformed or showing ovality must not be repaired or put in service.
- Mounting faces of the hub, ball seats and flat mounting surfaces of wheels¬ should be clean and free from foreign material or excess paint.
- Threads of studs and nuts should be clean, free from burrs or damage.¬ On disc wheels, the nuts must be tightened in a cross sequence and to the¬ recommended torque.
- Nuts should always be kept tight.
- Never permit oil or any lubricant to get into the ball seats of wheels, or on the ball faces of the nuts.

These are the main materials used to design a model. And some other materials also used to avoid the escape of gas. Those are,

Properties of thread seal tape:

- Thread seal tape is a polytetrafluoroethylene (PTFE) film tape commonly¬ used in plumbing for sealing pipe threads.
- The tape is sold cut to specific widths and wound on a spool, making it¬ easy to wind around pipe threads.
- Thread seal tape lubricates allowing for a deeper seating of the threads,and it helps prevent the threads from seizing when being unscrewed.
- The tape also works as a deformable filler and thread lubricant, helping to seal the joint without hardening or making it more difficult to tighten, and instead making it easier to tighten.

Properties of insulation tape:

- These Insulation tapes are made from fine quality raw material to ensure total quality control and safety required.
- These are not just high on temperature resistance but also chemical, weather and solvent resistant.
- These are also widely useful in construction of electrical equipment for insulation.

Vegetable Waste and kitchen waste: this is used as a main material for the production of gas. After decomposition it produces gas.

Cow dung: This is used in specific proportion for enhancing the decomposition• process and production of good quality of gas. **Water:** This is used for dilution of material.

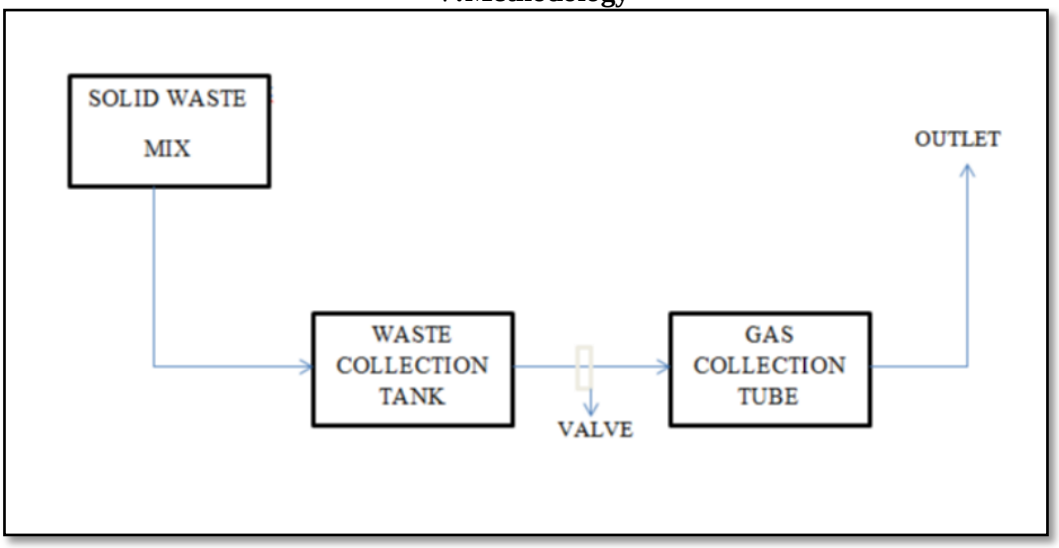
IV. Design

Design of model

The above figure shows the plan of a design.

I. Here we used water can as waste collection tank and tyre tube as gas collector (digester).
II. Choosing a right biogas digester is a very important while constructing a biogas plant.
III. And here tyre tube is used as gas collector.
IV. The collector should be a leakage proof and durable, non-reactive material• because it can be react with gas.sotyre tube is used. The produced gas passes through electrical pipe and collects in tyre tube.
V. The pipes are used to made the flow of gas smooth and it must be leakage proof.
VI. From the stand point of fluid dynamics and structural strength an egg shaped is• the best possible solution.

V.Methodology



Flow diagram of waste management

The solid waste can be used decayed or converted into useful product. But handling solid waste is very tuff task.

Methodological approach:

I. We collected the kitchen vegetable waste and segregated into bio degradable waste and non-bio degradable waste. Then the waste is converted into small pieces so that it helps and accelerates the speed of decomposition.
II. We had started this process in month of March. When the temperature willbe usually 28℃ - 35℃ in Majali, Karwar.
III. The vegetable waste was blended with certain proportion of cow dung andwater to accelerate the process of decomposition.

IV. We have turn the reference from the article "A **study of bio gas production from different kitchen waste**" by Rama dhanariya, Dr. Sarita Sharma, Dr. Ashok k Sharma, Dr. Sanjay Verma.
V. We have conducted the experiment in small scale where the results can be relevantly used for large scale processing of solid waste.
VI. So main problem faced during this process is the foul smell, production of• bugs and control of leakage of gas. These are the problems we can expect during experiment.
VII. So to control the odour where temperature, moisture and C:N are• managed. It controls the odour to some extent.
VIII. Odours from solid waste are caused by the breakdown of organic material.• Bacteria feed on organic material and produce sulphides as a result. These sulphide compounds convert to H2S - a pungent source of odour. They also form other volatile organic compounds (VOCs), which are released into the atmosphere creating a complex array of odours. Neighbouring residents and passers-by are forced to contend with the noxious smells.
IX. Surface treatment is used like a blanket or caps to cover decomposing• waste. In this way, the odours released by decomposition are suppressed within the solid waste.
X. Leakages at anaerobic digestion(AD) plants emit methane. This can be a• safety problem because of the increased danger of explosion. Additionally, CH4 is a potent greenhouse gas that affects our climate. And finally emitted gas cannot be used as renewable energy source and may influence the economic balance of an AD plant significantly. Leakage detection can be performed with gas sensors and leakage sprays• (aqueous solution with detergents sprayed on potential leaking spots or areas). These methods are very time consuming and many parts of the plant cannot be accessed by the staff. In contrast the use of mid-range IR cameras for methane visualisation offer an efficient method to analyse the whole AD plant on leakages- including parts of the plant that are difficult to access. If this technology is used professionally, this is the most recommendable detection method.
XI. We describe different methods for leakage detection and introduce an• evaluation scheme for leakage reporting at AD plants.

VI. Applications

1. This practice is highly lucrative
2. Keeps the environment clean and fresh.
3. Saves the earth and conserves energy.
4. Reduces environmental pollution.
5. Design materials are easily available.
6. Electricity generation can be done by using biogas.
7. Cooking fuel as sustainable energy source.
8. It can be used as a clean renewable fuel for transport vehicle.
9. It can be used in biogas fuel cells.
10. From the biogas combined heat and power can be produce.

VII. Conclusion:

I. This method can be adopted for the rural and urban area for Methane Gas production and consumption
II. After the production of Methane Gas left out material can be used as manure, It will be equal fertilize the soil and increase the yield of Agricultural production
III. By adopting this model operational costs and managing the Solid wastage easy and economic

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