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Waste Management and Energy Conversion

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***Abstract*— In the current situation, India is facing various challenges in the environment by the waste generated such as improper waste collection, treatment, transport, disposal. The most difficult challenge is from its inception to its disposal. Due to the increasing urban population, our country cannot survive with the current system which results in environmental and public health pollution. Waste can be solid, or liquid and each type of waste will have different methods of disposal. Waste will be a threat to human health and environment. Proper management of waste is necessary and important to have a healthy lifestyle. An unhygienic environment will be created if flooding of the dustbins happens every day. Waste segregation i.e., separation of dry and wet waste is also important. Segregation of waste helps in the reduction of the amount of waste that gets landfilled and reduces air and water pollution. If we segregate the waste, it is easy to dispose of compared to mixed waste. This application helps in segregating waste and converting into energy. Once the bin is filled it is indicated by level sensor, then the waste is crushed using crushers and moved to the biodigester in the form of slurry. Anaerobic digestion will take place in the digestor about 20-30 days. Once biogas is generated it is ignited and given to thermoelectric generator to generate electricity. This system which is proposed is developed by using level sensors, arduino, biodigester and thermoelectric device.**

Keywords—Waste Management, Renewable, Processing, Energy Conversion, Reduction of waste, Biogas, Anaerobic respiration.

I. INTRODUCTION

As the technology is developing, generation of waste is increasing rapidly. It is a major issue to discuss, as it has more harmful impact on humans, earth and living organisms. As we studied in an article per day 300-400 tons of waste is generated all over bangalore.in that 60 percent of waste is composed of organic (wet) waste. BBMP has taken many measures to reduce the waste production and treatment, but are not that effectively growing even with many related activities done. A doorstep waste collection is established where a person is assigned from BBMP will come to collect the waste every but, in this generation, people are busy with their schedule and are less concern about waste they are generating and dump the waste on the roads or in an empty site. Since the energy crisis, many countries are interested to develop biomass as a fuel source. Up until recently, the interest in biomass energy has lessened due to the technological breakthrough that makes fossil energy become relatively inexpensive. However, the high greenhouse emissions, deadly air pollution, instable fossil-based energy prices, and strong growth of global transportation fuel demand have boosted extensive research efforts in developing bioenergy. Bioenergy is energy derived from any fuel that is originated from biomass. Biomass is a renewable resource, like solar and wind energy, therefore has been considered as an alternative feedstock to provide sustainable energy in the future. Biomass is any organic matter-wood, crops, seaweed, animal wastes-that can be used as an energy source. Historically, biomass in the form of firewood has been traditionally used to provide energy to humans through direct combustion.

Biomass is any organic matter-wood, crops, seaweed, animal wastes-that can be used as an energy source. Biomass that is high in moisture content, such as animal manure and food-processing wastes, is suitable for producing biogas using a biological treatment process called anaerobic digestion. Anaerobic digestion is an environmentally friendly method of waste reduction and energy recovery. Anaerobic digestion involves bacteria that require an environment that is void of oxygen to survive. Converting organic waste to methane gas by anaerobic digestion can be considered a two-step process. The first step involves a group of anaerobic bacteria – referred to as the acid formers – that produces organic acids as a by-product of the initial organic degradation. The second step involves a group of bacteria – known as the methane formers – that breaks down the organic acids and produces methane as a by-product of the degradation of the organic acids, [1]. Anaerobic digestion was potentially viewed as an attractive method for waste stabilization prior to landfills as pre-treatment to reduce significant pollution land to the environment. As mentioned above, anaerobic digestion technology is suitable for use in biogas production. Biogas produced by anaerobic digestion can be used to fuel internal combustion engines to run a generator that produces electricity, [3]. Biogas typically contains between 40 and 60 percent methane, [4]. This high methane content makes biogas an excellent source of renewable energy to replace natural gas and other fossil fuels. Biogas is typically used in

factory boilers and in engine generator sets to produce electricity and heat. If internal combustion engines are filled with biogas to produce electricity, the facility can use the electricity or export it to the power grid. This kind of facilities had been established in wastewater treatment plants as well as landfills.

A. NEED TO STUDY

Inefficient municipal waste management system which may include inadequate communal containers for storing waste, lack of routine collection of waste and inadequate resources for the sanitization unit of effectively collect the waste generated, Negative impact on environment causing infectious disease and soil, water and air pollution can all result of improper waste management and disposal and occurs when either of them becomes contaminated with hazardous materials. Not only does this contribute to the creation of a greenhouse gas effects but also causes significant harm to marine and wildlife. As people migrating from the villages to cities for many reasons, population in cities increasing, we can barely find free land/area to landfill the waste as it requires many acres of land.

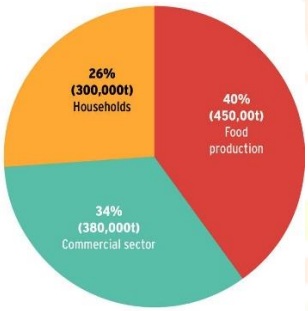

Fig.1 Waste Production

B.MOTIVATION

To reduce the amount of organic waste to land filling and utilizing it to produce biogas, which is a renewable source of energy and to reduce the greenhouse gas emissions and risk of pollution to water ways. Biogas is a green energy source in the form of electricity and heat for local grid. When it comes to environment, has less emission of greenhouse gasses methane, CO2, and nitrous oxide. It is environment friendly recirculation of organic waste from industry and households. Biogas is a promising renewable energy and can be either captured from landfills or can be produces from a variety of wastes.

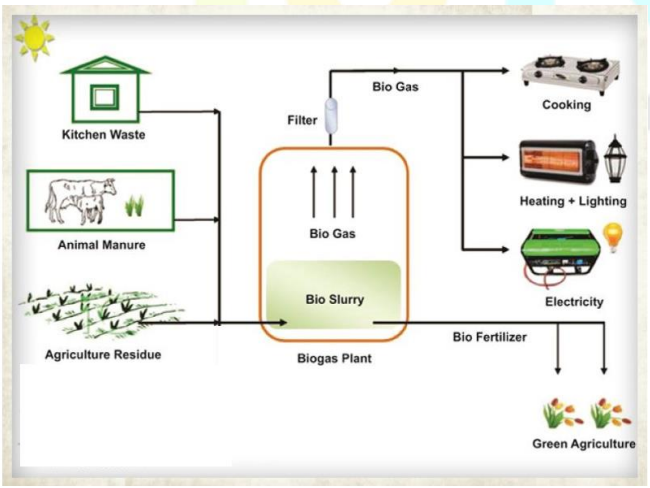

Fig.2 Bio waste power station

II. OBJECTIVE

- Providing renewable and sustainable source of energy for domestic consumption
- To assess organic waste management both at small scale (household level) and large scale (municipal level)
- To ascertain the attitude and perception of people towards organic waste management.
- Reduction of greenhouse gas emissions and need for an alternative source of energy.

III. METHODOLOGY

A. FLAWS IN EXISTING MODEL

As per the report of BBMP Per day 300-400 tons of waste being generated all over Bangalore city. In that wet waste comprises of 60% which is going to landfills. Organic waste is a great source if it is processed in right way. It includes Organic waste like Kitchen/food waste, Organic market waste, Garden& Horticulture waste, Wood/ leaf ashes.

- The collected waste is processed, either to landfill or recycling. And some of them left untreated.
- BBMP is processing solid waste to generate energy, to minimize land fillings.
- Only few plants were constructed, currently one or two are working.
- As BBMP spends 555crores every month to collect and process the waste. Which is costlier, high maintenance required, time consuming and less effective.

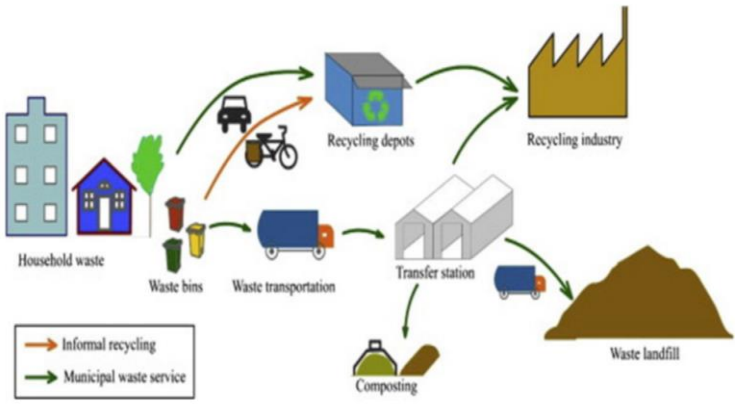

Fig.3 The Waste Management Cycle

B.PROPOSED MODEL

Smart dustbin is a normal dustbin elevated using a microcontroller-based platform Arduino Uno board interfaced with ultrasonic sensor. It consists of 2 main modules the mechanical designed components and the electric components.

The mechanical components consist of crushers, digestors and the load sensing plate while the electric components consist of various components that are the Arduino UNO, electricity generator, battery or cell. When the user dumps the trash into the dustbin the trash will get collected onto the load

sensing plate present in the dustbin. The load sensor has been attached to the load sensing plate this sensor will measure the weight of the trash been dumped in the bin. once the set limit of weight has been reached the outlet valve to crushers is opened and the trash id moved to through the crushers to make it fine particles to increase the decomposition rate. The crushers are let to biodigester, where the crushed trash has been settled. It is allowed to anaerobic digestion for 20-30 days to decompose and to produce biogas. Generated biogas is collected in a biogas tank, then let through gas outlet and is given to the electric generator to produce electricity. Thus, electricity is stored in a battery, which can be used for domestic use. And the left residue in the digester is let out through outlet valve which is a rich source of nutrients for plants as a fertilizer.

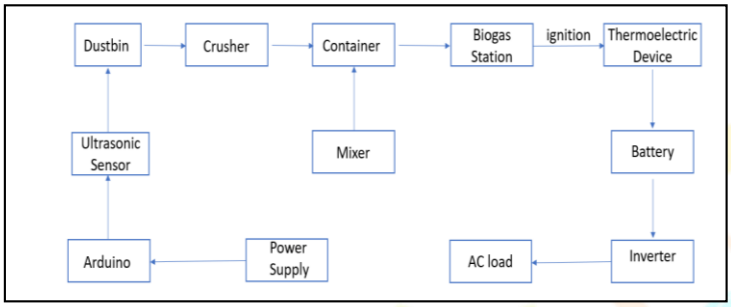

Fig.4 Block Diagram

IV. EXPECTED RESULT

After building the model the, the level of the garbage in the dustbin will be indicated by the level sensor, it is crushed using crushers and moved to the biodigester in the form of slurry.

Anaerobic digestion will take place in the digestor about 20-30 days. Once biogas is generated it is ignited and given to thermoelectric generator to generate electricity.

The left out digestate is rich in nutrients which can be used as fertilizer for plants.

It is reasonable to assume that anaerobic digestion technology is suitable for use in biogas production. Biogas is a valuable fuel that can act as substitute. Therefore, it can be competitive with market natural gas purchase for power generation. In terms of electricity energy supply, a distinction is made between types of renewable energy systems where renewable energy systems are described as stand-alone or connected to the electricity grid ("grid-connected"). Such a network of grid-connected renewable energy systems is the Landfill Biogas Generation System. Substitution of fossil fuel-based electricity by electricity generated from renewable sources is, however, another sustainable development benefit of this kind of projects. Moreover, biomass carbon dioxide emissions on an energy basis are comparable to coal but there is one important difference. The biological growth of biomass fuels consumes carbon dioxide as part of the photosynthetic process and thus their contribution to global warming is zero.

V. CONCLUSIONS

Due to the adverse effect of energy production from traditional fossil fuels, the move toward renewable and sustainable energy has become imperative. It is critical to educate people and encourage them to practice Recycle, Reuse and Reduce instead of producing waste. Conserving energy results in lower living expenses as energy savings leads to monetary savings. It also helps protect the environment from excess resource use and carbon dioxide emissions. Waste to energy achieves a reduction of green house gas emissions through various mechanism resulting reduction in CO2 emissions from fossil fuel-based electrical generation and generates clean energy and helps to protect the environment from excess resource use.

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