

# CIRCULAR ECONOMY AND FOOD WASTE

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**ABSTRACT** – The goal of circular economy is high on national and international levels. A circular economy is targeted at making optimum use of natural resources, raw materials and products and reusing them. The circular economy makes both environmental and business sense and to make use of waste treatment and management has now become a crucial problem. Due to inadequate and insufficient collection, disposal and treatment techniques we are facing a severe problem of environmental pollution. It is the duty of local governing authority to provide proper solid waste treatment and management techniques in order to keep our city hygienically clean and environmentally healthy. One method used in order to reduce this growing problem of disposal is the conversion of the wet waste to electricity. This paper includes the technology adopted by Kagal Municipal Corporation that involves the utilization of food waste as a resource for the generation of electricity.

**Index Terms** - Disposal treatment, Energy, Food waste, Reuse, Solid waste Management, Food Security

## I.INTRODUCTION

Food is one resource that requires critical attention. Reducing food waste has the potential to save resources, reduce pollution and increase food security. In many developed countries more food is wasted than developing countries. So to overcome this, optimum use of natural resources, raw materials and products and reusing them is essential. The aim of a circular economy is to use natural resources for longer, avoid waste, prevent environmental pollution and to get best out of waste, extract the maximum value from them while in use, then recovery and regenerate products and materials at the end of each service life. The Circular economy is restorative and regenerative by design. Relying on system- wide innovation, it aims to redefine products and services to design waste out, while minimizing negative impacts. Looking at the current scenario of waste generation and disposal system, optimum processes focusing on positive society wide benefits need to be designed. A circular model is based on these principles –

- Design out waste and pollution.
- Reep products and materials in use
- Regenerate natural systems.

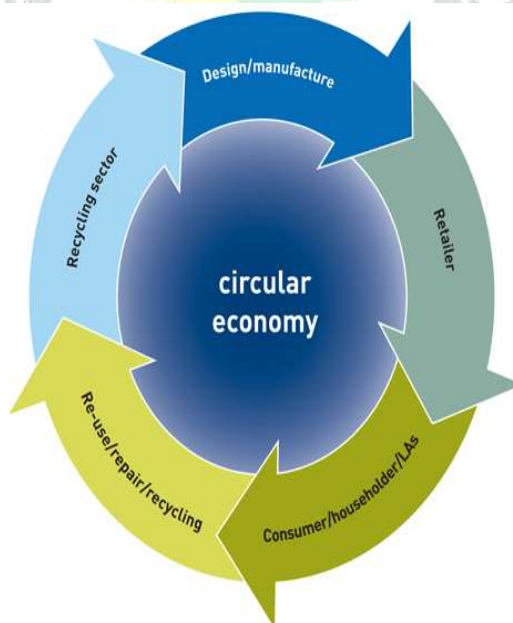


Figure: Circular Economy

Food waste is one of the increasing environmental problems. Food is wasted at all levels but households are the most wasteful element. In household contexts food waste is increasingly considered an environmental problem. In a broader understanding of circular economy and food waste perspective every individual in a family should take initiatives to promote the

reduction of food thrown away in houses, but it is still not clear why and where the food gets wasted. On the contrary shopping, storing, cooking, eating, sharing are the activity that activities that needs to be emphasized.

## II. Case Study:-

Kagal is a town in Kolhapur district of the Indian state of Maharashtra having a population of 23,775 (2011). Waste treatment and management has now become a crucial problem due to inadequate and insufficient collection, disposal and treatment techniques. Therefore, it is a duty of local governing authorities to provide proper solid waste treatment and management techniques in order to keep the city hygienically clean and environmentally healthy. For solid waste management some available technologies for treatment, processing and disposal of waste are Composting, Vermicomposting, Incineration, Pyrolysis and gasification, Plasma pyrolysis, Pelletization, Sanitary landfills .However in India Pyrolysis, Plasma pyrolysis and pelletization are rare technologies. Whereas composting, vermicomposting, Incineration, Sanitary landfill are mostly preferred methods. To overcome the problem of solid waste especially the food waste, Kagal Municipal Council is working and planning towards making the city clean.

The Kagal municipality has succeeded in generating electricity from food waste by generating methane gas. Major the street lights are LED bulbs that run on electricity generated from good waste.



Figure: Segregation of Food waste



Figure: Green Box (Energy generation plant)

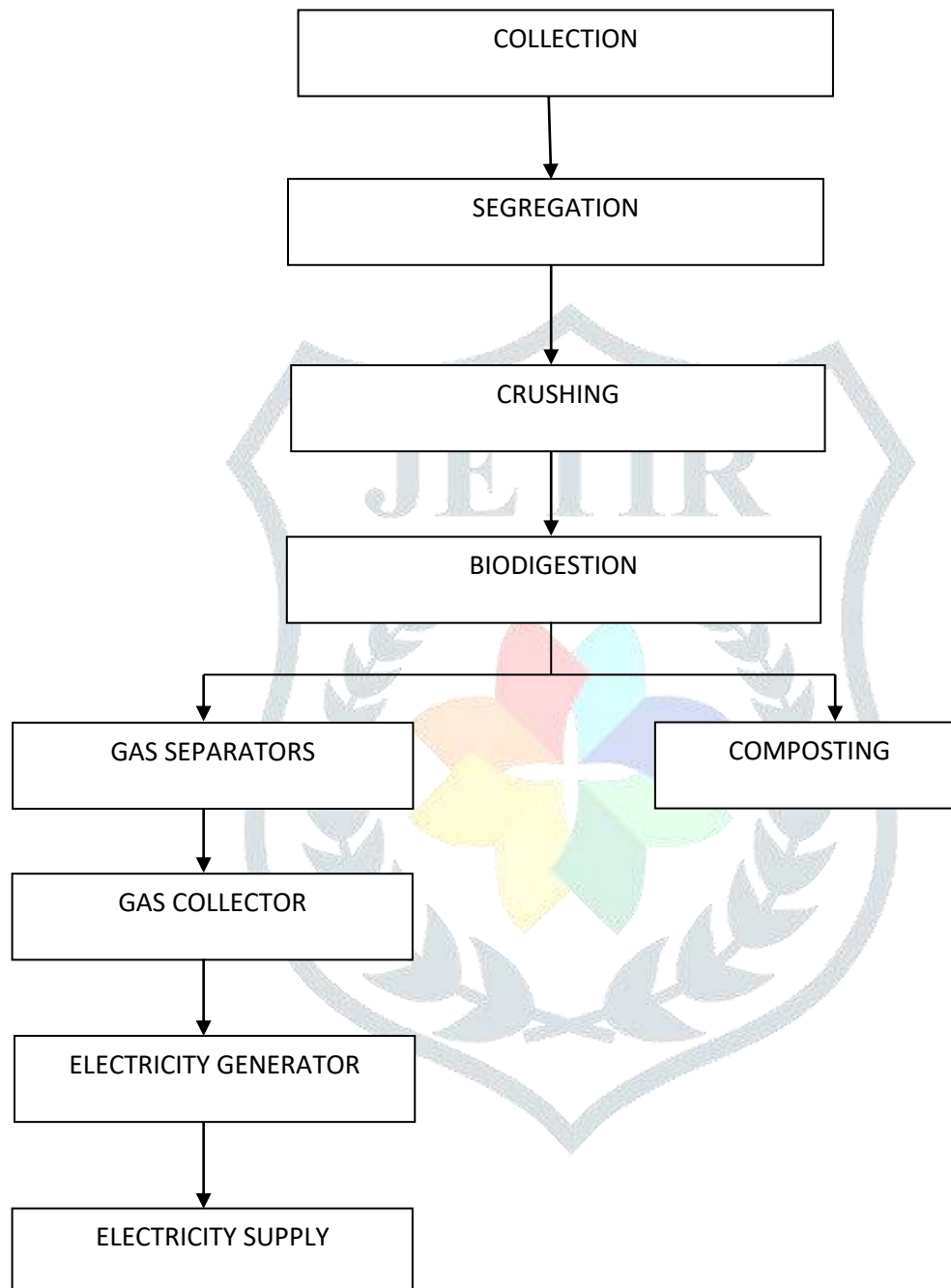
**Flow Chart:-**

Figure: Flow Chart of methane gas generation from food waste.

**III. About the Project:-**

The Kagal municipality has succeeded in generating electricity and compost from food waste in R.S No.406 and five acre space. This project is based on joint partnership. The project will fulfill the increased requirements in future as it will work according to the growth in population and expansion of the city which will cause to growth in waste also. While undertaking these ambitious projects, future 30years population has been considered and then the project has been erected. The citizens of Kagal are compelled to sort out wet and dry waste in colour code buckets. Hence from whole city 9 MT solid

wastes is collected per day. Out of which 4MT is being processed and electricity is produced and remaining 5MT dry waste, plastic, glass, rubber, iron and bottles are sorted by rag pickers. These steps are making the further things like disposal and sorting easy. The vehicles used for collection of solid waste are provided with GPS tracking system vehicle and hydraulic vehicle to collect waste quickly. German Technology is been used in the project having green box technology and its capacity to manage processing matches from 34095 population according to 2011 census to approximately 50,000 to 55,000 population according to 2028-2030 census. Approximately 25 to 30MT will be processed to produce an electricity and compost. Hence the Kagal municipality has successfully activated this undertaken project by considering the growth of future 30years population, waste generation and its disposal and confirmation to continue the project with its free capacity.

The initial stage is door to door collection. The houses are provided with buckets for storing the solid waste during collection. As solid waste carrying vehicles are provided with GPS tracking system, maximum waste is collected in min time. Everyday Solid waste generated in Kagal is 23 tonnes. Out of which 4 tonnes is wet food waste that is used to generate 500KW of electricity and remaining 19 tonnes is mix waste. On this 500Kw electricity 1000 – 1200 LED of 36 Watts runs.

#### **Detail Process:-**

During initial stages of the process the food waste is mixed with cow dung and continuous agitation is done for 21 days for gas generation. But once the gas starting generating then it becomes a continuous process and hence no retention is required. The collected wet food waste is taken to feeding tank having a capacity of 500Kg. In the ratio of 1:1 water is added to feeding tank. (1 Kg wet food waste: 1 lit of water) and crushing is started. Further it goes to Massinator for re crushing. After proper crushing of waste is achieved it goes to digester tank having a capacity of 90,000 lit. Digester is insulated with glass wool from inside and coated outside from aluminum to maintain the temperature of 37°C. The digested material further goes to Gas Fluid Separator where the gas is collected from upper side in the balloon and slurry also known as liquid compost appears black in colour. The slurry is collected is toxic and dewatered. Again this water can be reused for crushing or can directly used as liquid compost. Since it consists of NPK 3 times enriched nitrogen than vermicompost. PH is also maintained up to 7.

The generated gas is collected in Neuoperine ballon of 60 mcu. Moisture from gas is removed, also H<sub>2</sub>S and CO<sub>2</sub> gas generated along with Methane gas are removed by scrubber and only methane gas is filled in compressor where it is compressed by 5 bar pressure. The pipe is attached to generator which further gets converted into electricity

#### **IV. Conclusion:-**

From the overall study it has been understood that the Kagal Municipality has come in lime light as the only municipality to light up the street lights and roads by the electricity generated from CH<sub>4</sub> gas produced by decomposition of food waste. Producing its own electricity and conducting concept of zero waste is an initiative to develop and connect economy and environmental gains. In true sense it is an achievement and integral approach through circular economy.

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