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Computer Aided Modeling & Implementation of Assembled Disposing System for Food Waste

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ABSTRACT: With millions of people all over the world struggling to find enough food to eat, the fact that millions of tons of food is tossed out every year can be surprising. But it is true. Food waste is a huge problem in developed countries and it is a serious economic and environmental issue. The food wasted took resources to make. It used up huge amounts of water, land, and fertilizer only to be tossed in a landfill. The food in landfills decomposes and emits methane, a poisonous greenhouse gas. Globally, methane gas from food waste makes up seven percent of total greenhouse emissions. If the food had been composted properly, it would have emitted carbon dioxide, which is a less potent greenhouse gas. So the acquainted project here is "DESIGN AND FABRICATION OF FOOD WASTE DISPOSER', in order to prevent the effect of methane released from the food waste on environment .This helps in decomposing waste food within a short span of time, by using water and converting it into liquid and can be used as manure .This can be done by using a wide variety of food waste shredders and grinders which reduces food stuff down to size. By comparing the different digester available, best one is chosen.

KEYWORDS: Disposer, Food Waste, Hopper, Blades, Water Controllers, Assembly, Organic Waste.

I. INRODUCTION

FOOD WASTE:

Food waste or food loss is food that is wasted, lost or neaten. The causes of food waste or loss are numerous and occur at the stages of producing, processing, retailing and consuming.

Food wastage is a global problem. According to Food and Agriculture organization (FAO) of the UN, approximately one third of the food produced for the human consumption, which amounts to 1.3 billion tones, gets lost or wasted. It is estimated by the UN that nearly 40% of the food produced in India is wasted or lost. And this cost India one lakh crore rupees every year. 50 percent of all U.S. produce is tossed instead of eaten, while a full third of all foodstuffs aI produced only to be wasted.

CAUSES :

Lack Of Appropriate Planning, Purchase and Preparation Of Too Much Food, Errors In Industrial Processing, Managerial, Financial And Technical Constrains, Over-preparation Of Food, Over-merchandizing And Over-ordering, Consumer Behaviour.

FFECTS OF FOOD WASTE

BIODIVERSITY LOSS :

Food wastage impacts on biodiversity loss at a global level. In order to maximize agricultural yields, farmers have increasingly invaded wild areas in search for more fertile lands which has led to loss of biodiversity. The reason for this is that practices such as slash and burn, deforestation, and conversion of wild areas into farm lands have destroyed the natural habitats for birds, fish, mammals and amphibians.

Agricultural practices such as mono-cropping have also compounded biodiversity loss. The mass rearing of livestock for consumption and the use of pesticides in crop production has also significantly contributed to nitrogen, phosphorous, and chemical pollution in streams, rivers and coastal waters thus affecting marine life.

WASTAGE OF THE 1/3 OF THE WORLD

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FERTILE LAND AREAS

According to research, the produced but unconsumed food accounts for approximately 1.4 billion hectares of land, constituting almost 1/3 of the planet's agricultural land. By looking at this from a well thought analytical angle, the world is wasting 30 per cent of the world's fertile land which could be used for other meaningful purposes such as environmental research.

BLUE WATER FOOTPRINT:

The volume of water used in agricultural food production is immense. Therefore, if 30 per cent of all the food produced goes to waste, then it means that more than 30 per cent of freshwater used in the production and processing of food also goes to waste. This contributes to blue water footprint which refers to the amount of consumed surface and groundwater resources that goes to waste.

Precise estimations indicate that food wastage is responsible for the wastage of nearly 250 cubic kilometres (km3) of water. This wastage is equivalent to thrice the volume of Lake Geneva. It is also affirmed that throwing out a kilogram of beef amounts to a waste of 50,000 litres of water used in the meat production process. Similarly, 1000 litres of water is wasted if one glass of milk is poured down the drain.

INCREASED CARBON FOOTPRINT:

The food produced and then later goes to waste is estimated to be equivalent to 3.3 billion tons of greenhouse gas emission, accelerating the impacts of climate change. Research also has it that food waste is the third biggest emitter of greenhouse gases.

The reason for this is the consideration for the energy wasted and the primary use of fossil fuels in food production including processing and cooking together with transportation to various consumer markets worldwide. What's more, the methane gas produced at landfills by food thrown out as waste further aggravates climate change and global warming.

ECONOMIC CONSEQUENCES:

In addition to the environmental impacts, food wastage also results in direct economic costs. According to FAO's report estimates, the economic losses associated with food wastage is about $750 billion dollars per annum.

SOLUTIONS OF FOOD WASTE

Balancing Food Production With Demand, Bettering Harvesting & Storage Process, Food Waste Reduction Initiatives, Consumers To Buy And Prepare Food With A Plan, Food Recycling, Food Print Campaigns.

II. LITERATURE REVIEW

The Sewage sludge-to-energy approaches based on anaerobic digestion and energy efficiency assessment with Alternative Energy Technologies and High tech Solutions for urban Carbon Reduction as Microbial biomass content and enzymatic activities got after the application of organic amendments to a horticultural soil. [1,2,8]

The development of manure management is indulged with implications for greenhouse gas emissions. Mainly Animal Feed Science and Technology forwarded to the influence of halophytic compost, farmyard manure and phosphobacteria on soil microflora and enzyme activities as know to the appliances. [3,9]

The evaluation of stability and maturity during the composting of cattle manure which indulged in the development of an investment decision tool for biogas production from agricultural waste reducing greenhouse gas emissions and biogas potential from livestock in Ecuador which can be essential to Energy for Sustainable Development [4,6,10]

Waste Management dealing with the Potential for carbon offsets from anaerobic digesters in livestock production imbibing with trending concepts including environmental & economic life cycle assessment for future sewage sludge to energy technologies. [5,7]

III. METHODOLOGY

A food waste disposer is an on-site food waste disposal solution that may be the key to achieving significantly reduced costs, pests and environmental impact for food businesses. A food waste disposer can be as small and compact as a dishwasher or larger for institutional applications. The food waste is added directly to the digester, and with the aid of microorganisms, water and oxygen can be "digested" into a safe, liquid form.

By addressing the organic waste at the point of generation, it is possible to remove it from landfills, reducing or eliminating the cost of hauling away food waste. It is also possible to significantly reduce negative environmental impact and pest populations. Food businesses, grocery stores, universities, nonprofits and other groups dealing with food waste can address organic waste at the point of generation with an aerobic food digester.

The main purpose of fabricating this food waste disposer is these are an environmentally responsible alternative to typical disposal methods like landfills. And, they can help reduce greenhouse

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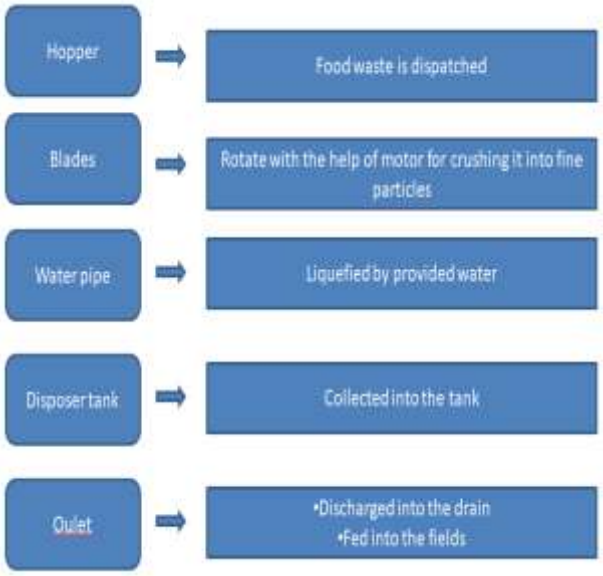
gas emissions. Food waste is even being processed and used for renewable power by many wastewater treatment plants.



COMPONENTS

The different components used in the food waste dispenser are:

Hopper
Blades
Motor
Water controllers
Disposer
wood base

HOPPER:

The hopper chamber is the hollow cylinder that houses the disposal.The lower hopper chamber is insulation-lined and contains the disposal's motor. This section also connects to the waste line. After the disposal grinds it up, food moves through one segment of the lower hopper chamber on its way out to the drain pipe**.**

SPECIFICATIONS:

Length of the base	85mm
Height of the hopper	80mm
Material for hopper	Steel

BLADES:

The main function of blades is to crush the food materials into fine particles and grind the food particles with the help of water and converts it into a semi-solid paste which is collected by the disposer.

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SPECIFICATIONS:

Length of the shaft	=	106mm
Thickness of each plate	=	1mm
Diameter of shaft =		3mm
Distance between each plate		5.42

MOTOR:

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of rotation of a shaft.

SPECIFICATIONS:

Total lTotal length of base	300mm
Breadth of base	160mm
Thickness	10mm
Material	wood

WATER CONTROLLERS:

Water controllers are used in this machine to crush the waste and to convert it into semi-solid paste and it will also be useful for easy moment of waste without any interruption. These food wastage can either be collected and used as a fertilizer of it can be sent into drainage which reduces the emission of bacteria than the original level. The paste which is converted can be used for the production of useful methane gas.

DISPOSER:

It collects the semi-solid waste and pumps into the tubes and then it is directly connected to the drainage system or to the agriculture land. The another way of using this disposer is to it is used for collecting the semi-solid paste and store it. After that the semi-solid pastewill be decomposed by mixing some enzymes so it will be decomposed under the ground and after certain period of time it produces useful methane which can be used as biogas and it is free from pollution.

SPECIFICATIONS:

Length of the base	85mm
Height of the disposer	70mm
Material of disposer	steel

WOODEN BASE:

This wood base gives best support to fix all these components. This wood base gives support and fix all the components to its surface. This reduces the vibration motion of the total assembly. This is made of wood.

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SPECIFICATIONS:

Type of Motor	DC Motor
Voltage	12 Volts
Current	1 ampere
RPM	300

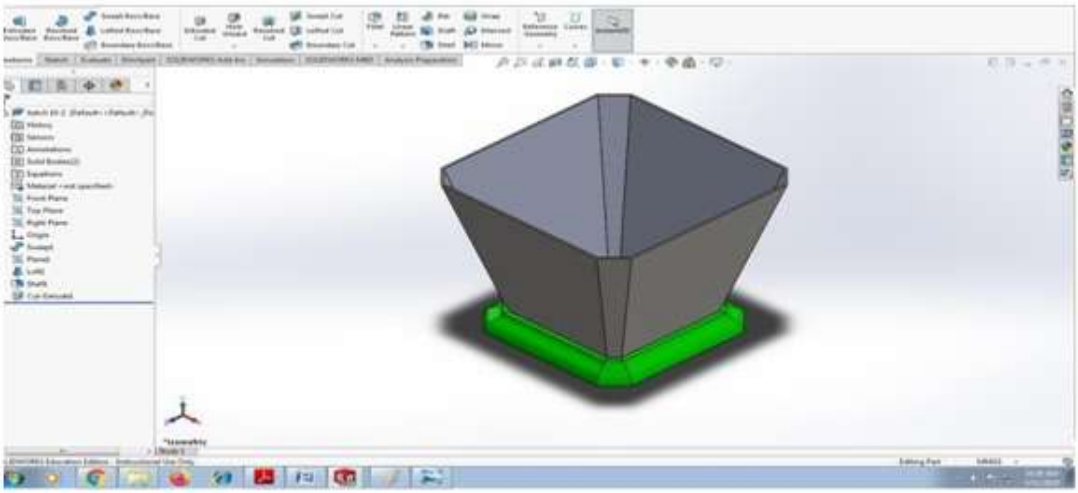

Figure1: Hopper

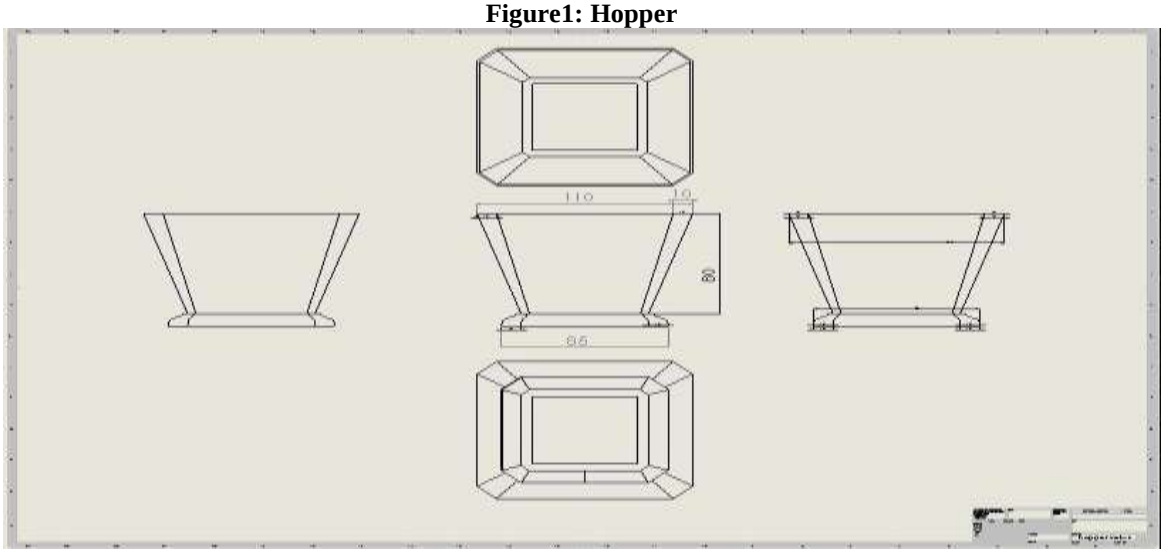

Figure2 : Views of hopper

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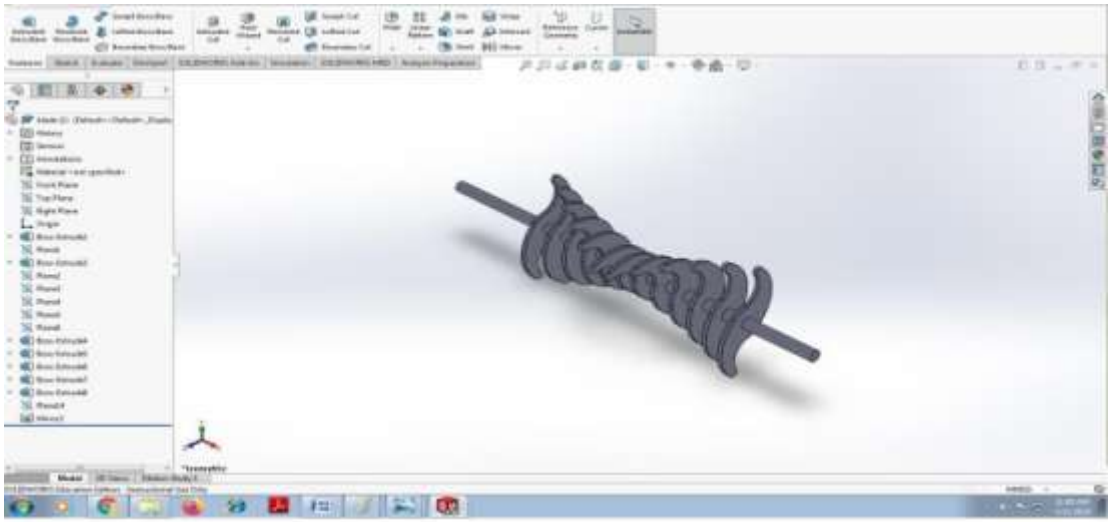

Figure3: Blades

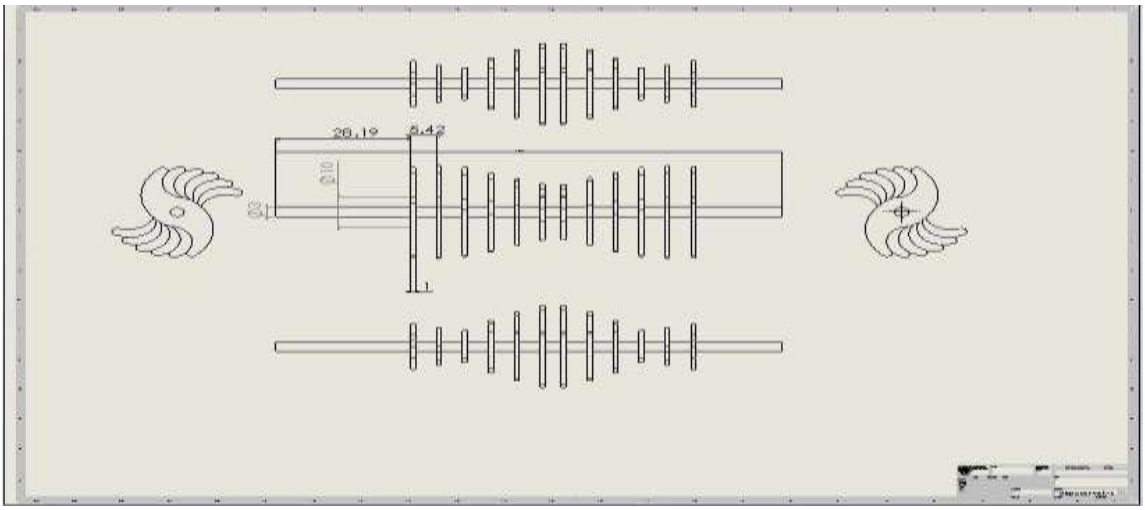

Figure 4: Views of blades

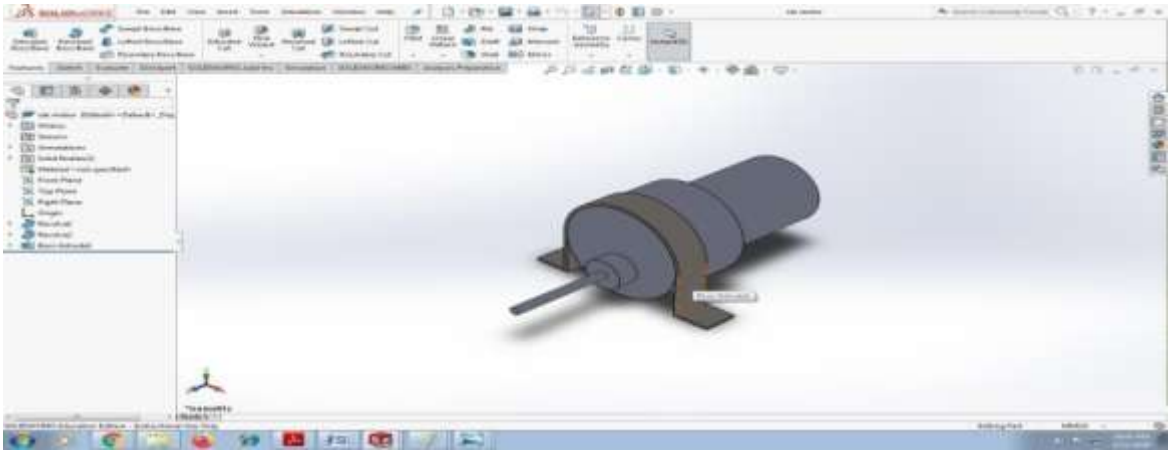

Figure5: Motor

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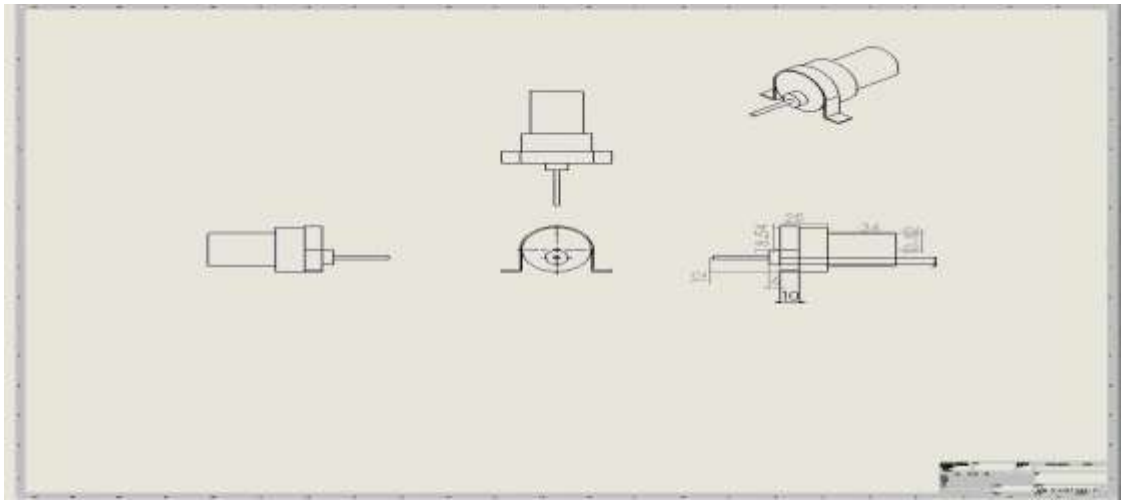

Figure6: Views of motor

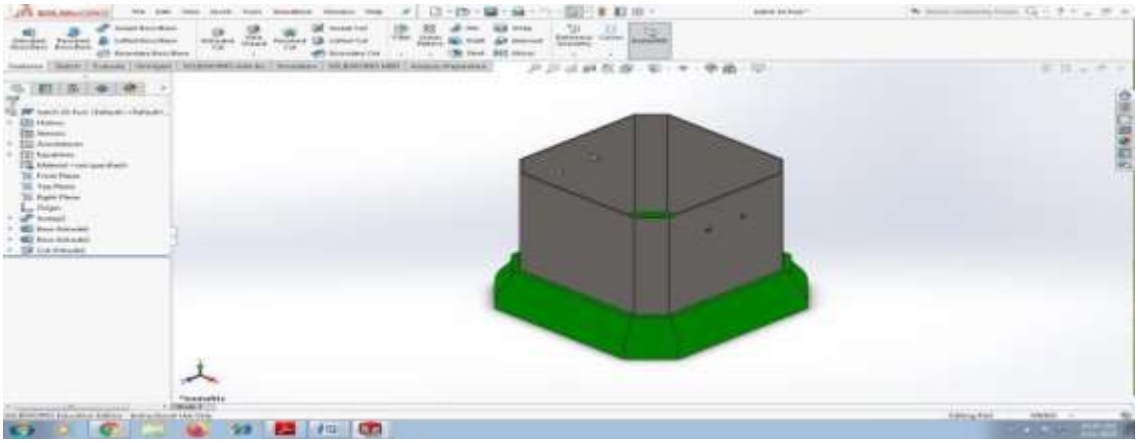

Figure7: Disposer

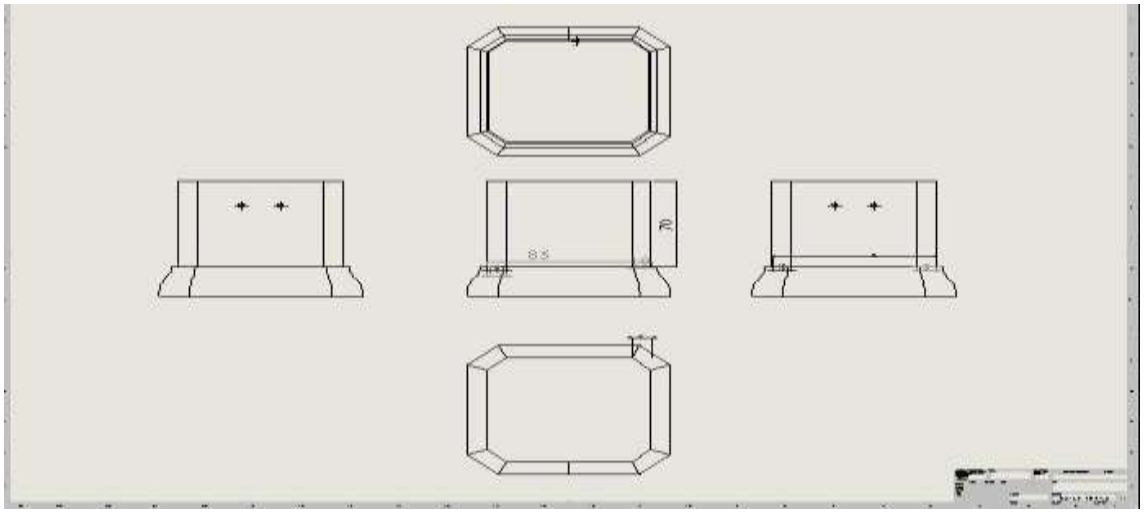

Figure8: Views of disposer

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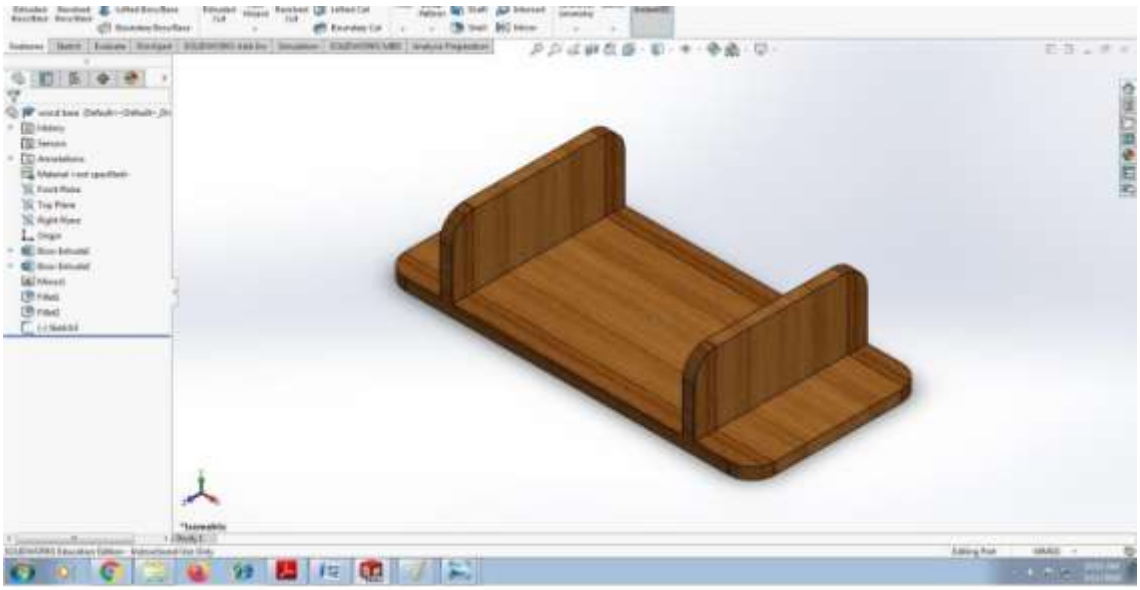

Figure9: Wooden base

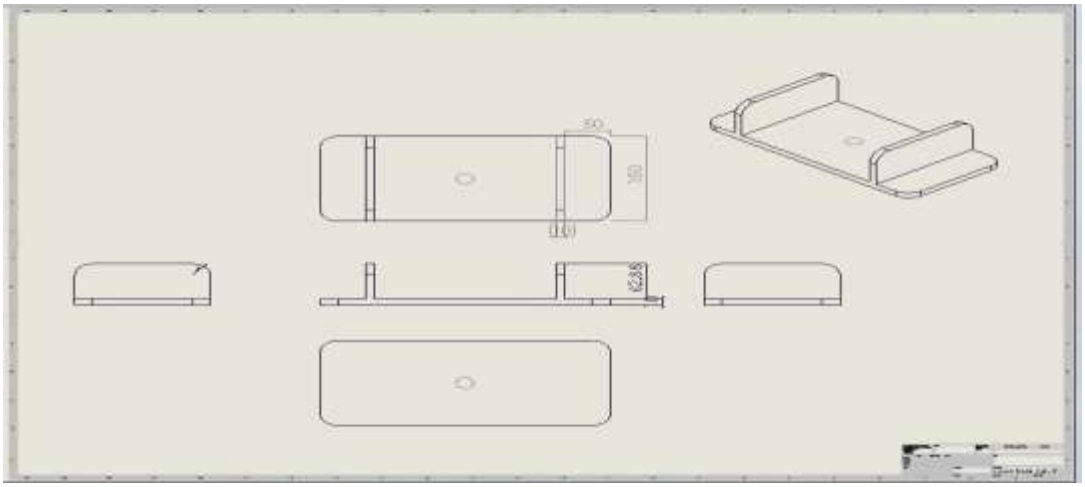

Figure10: Different views of wooden base

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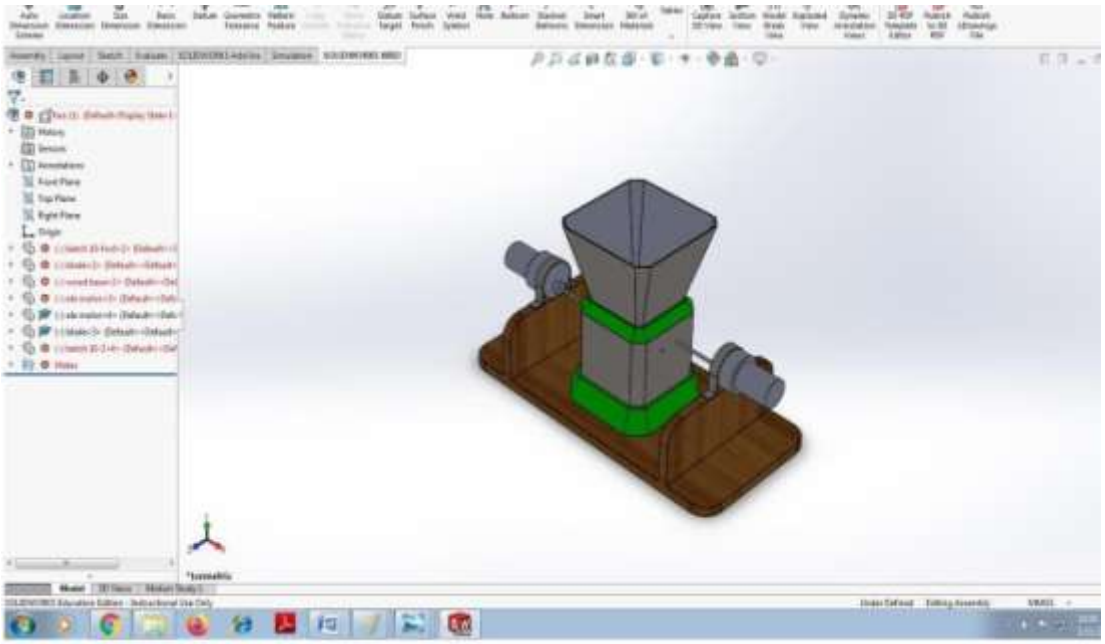

Figure11 :Final assembly

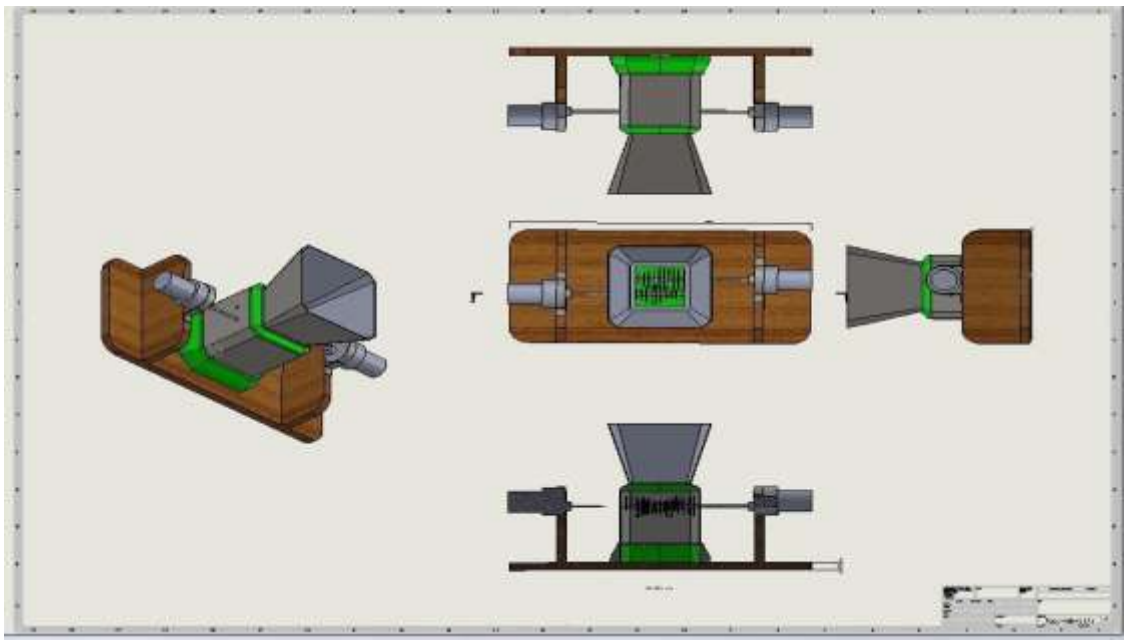

Figure12: Final assembly views

IV. RESULTS AND DISCUSSION

The time taken for the each individual vegetable for crushing is shown below:

Type of vegetable	Time taken for crushing
Brinjal	40 sec
Tomato	20 sec
Total vegetable waste	14sec

Initially Geometrical model is designed using Solidworks computer Software in 2Dimensional and 3Dimensional views. The designed model is manufactured part by part. The wooden base shown in Figure9 is made using Carpentry. The required hp Motor shown in Figure5 is considered as an external fit. Using machine tools and soldering method, the holes and cuts are done to wooden base, dispenser shown in Figure 7 and hopper shown in Figure 1 according to the dimensions required. Blades shown in figure3 got fit to the hopper and arranged according to dimensions for better crushing output stuff. By Assembly method, the designed output is finalized as shown in Figure11 and 12. Particular raw food items had to be considered as a case study. Basically Brinjal is crushed into micro pieces in 40sec, tomato in 20 sec, and further the total waste in 14 sec. The hardness of bulk waste can also be crushed accordingly by flushing out the organic waste with fixed water controllers.

There's lot of scope in many sectors in various fields in further which includes Food and environmental security, Optimizing the renewable energy generation, Anaerobic digestion of Organic waste, Commercial to Domestic food waste disposal ritual appliances, Automated disposers using sensors and Composting food waste creates fertilizer mainly considering the major ambiance conditions in daily chores of Present Genaration.

IV. CONCLUSION

Food waste is a huge problem in developed countries and it is a serious economic and environmental issue. The food wasted took resources to make. It used up huge amounts of water, land, and fertilizer only to be tossed in a landfill. The food in landfills decomposes and emits methane, a poisonous greenhouse gas. Globally, methane gas from food waste makes up 7% of total greenhouse emissions. If the food had been composted properly, it would have emitted carbon dioxide, which is a less potent greenhouse gas.

For this problem we have come up with a solution called "FOOD WASTE DISPOSER" in order to prevent the release of harmful gas methane into environment. This food waste disposer crushes the waste food and converts into semi-solid paste and this paste can be used as manure it can be done by shredders and grinders and rollers explained above. This semi-solid paste can be decomposed in the ground for certain period and can be used for producing methane gas which is useful for cooking.

V. ACKNOWLEDGEMENT

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