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Quantity of Gasifiers for Waste Disposal and Energy Production in Next Twenty Years

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ABSTRACT

As the population of world is increasing exponentially the problem of disposal of organic waste is also increasing accordingly. Increasing population acquires land for their survival therefore land requirement is also increasing exponentially. The waste coming from this increasing population is also increasing exponentially [3]. This fact results for the lot of crisis for the organic and inorganic waste disposal. Since the land availability is increasing exponentially according to increased population and for waste disposal therefore the disposal cost of disposal of organic and inorganic wastes is also increasing accordingly. This research paper suggests for the number of gasifiers that should be installed per year to cope up with the organic wastes coming from the increased population and to fulfill the requirement of energy throughout the world [4-7].

Keywords: Population, Exponentially, the Organic and Inorganic Waste, Disposal, Energy

I. INTRODUCTION

Waste and living society both are complementary terms because the wastes cannot be avoided for any human beings and animals. The waste coming out from animals are organic wastes and these are self-degradable.

The wastes coming out from the human beings are of both types as organic wastes and non-organic wastes. These organic wastes are similar to the self-degradable wastes but the available land for its disposal is not sufficient. It is because the land where these organic waste materials are degraded should be open to atmosphere and the waste gases releasing from degradation process should not interact to the human beings. Because these emitted gases are very harmful for health. Therefore the availability of land for the disposal of organic waste is the major problem. If these organic wastes are utilized for the production of energy then the energy crisis problems can be avoided with increasing demand of energy as increase in population of world [8, 9].

It is observed that the population of world if increasing by rate 3% per year. And the present population of the world is 740, 497, 6783 in 2016. Therefore this population would be doubled in next fifteen years. This new population would be the major source of organic waste. This organic waste can be used for energy production in the form of electricity or any other forms [1].

II. METHODS AND MATERIAL

1. Gasification

In the reference of disposal and energy production from organic wastes; in the gasification process the organic fossil fuel based organic wastes can be converted into carbon mono oxide, hydrogen and carbon di oxide.

In gasification process the organic wastes are poured into the hopper. Inside the hopper this organic waste is heated above the temperature of 700 ^{0}C, with the controlled amount of oxygen or steam. Generally gasification is a convertible process which converts the biomass resources available in organic wastes into the gaseous compounds such as producer gas or syn gas. In gasification process the lesser amount of oxygen is supplied in the gasifier where the organic wastes are present in between the temperature range of 600 ^{0}C to

1500 ^{0}C. In this process low to medium energy gases are formed according to the process involved and operating conditions. The fuel gases or syn gases obtained in gasification can be used to produce power, heat steam or energy [1,5].

2. Gasification Mechanism

The result of gasification is the production of volatile compounds like syn gases or producer gases.

When the gasification temperature is comparatively low as between 700 ^{0}C to 1000 ^{0}C then the mixture of gases like carbon mono oxide (CO) , hydrogen (H_2) , carbon di oxide (CO_2) and other hydrocarbons are produced. This mixture is known as producer gas. Producer gas can be used to heat the boiler, fuel as in internal combustion engines and for electricity generator[5].

When oxygen or steam at high temperature is fed into the gasifier then a mixture of carbon mono oxide (CO) and hydrogen (H_2) is produced during the gasification process and the following reaction occurs;

Organic Wastes + Controlled Air $\longrightarrow$
$CO + H_2 + CH_4 + CO_2 +$ Water Vapor $+ N_2$

3. Predictive Analysis

The growing population of the world is accelerating the problem of disposal of a huge quantity of municipal solid waste. A report says that the population growth rate of world is about 70 million new peoples per year. This growth rate is a major problem related to the waste disposal and energy demand. If the growth rate continues till next twenty years then the need of land for waste disposal will be doubled. But increased population also occupies the space for their survival like for accommodation and agriculture. This results a major problem. Application of gasifier may be a perfect solution for this challenge [2,6].

4. System Dynamic Modeling

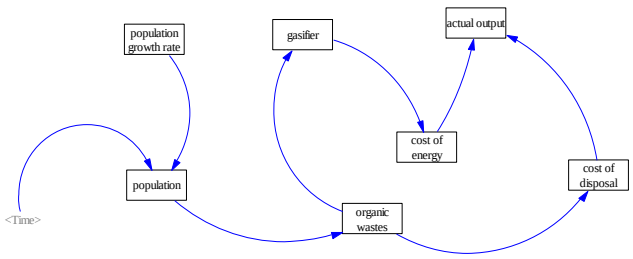

Figure 1. System Dynamic modeling for gasifier quantity

5. Related Programming

(01) actual output=
cost of energy+cost of disposal
Units: lakh

(02) cost of disposal=
organic wastes*1e+008
Units: lakh

(03) cost of energy=
gasifier*1.5
Units: lakh

(04) FINAL TIME = 20
Units: Year
The final time for the simulation.

(05) gasifier=
organic wastes*1e+012/7300
Units: numbers

(06) INITIAL TIME = 0
Units: Year
The initial time for the simulation.

(07) organic wastes=
(0.365*population)
Units: billian ton/Year

(08) population=
7.4*EXP(population growth rate*Time)
Units: billian

(09) population growth rate=
0.03
Units: Year

(10) SAVEPER =
TIME STEP
Units: Year [0,?]
The frequency with which output is stored.

(11) TIME STEP = 1
Units: Year [0,?]
The time step for the simulation.

III. RESULTS AND DISCUSSION

1. Output Graphs

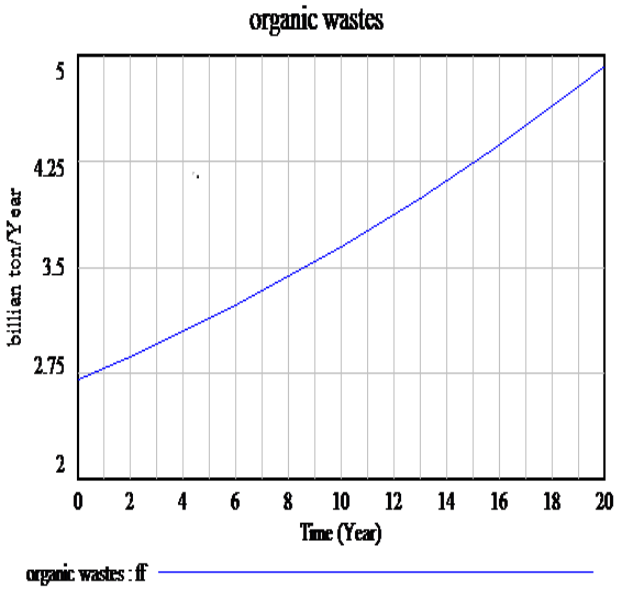

Figure 2. Showing the figure of organic wastes for next twenty years

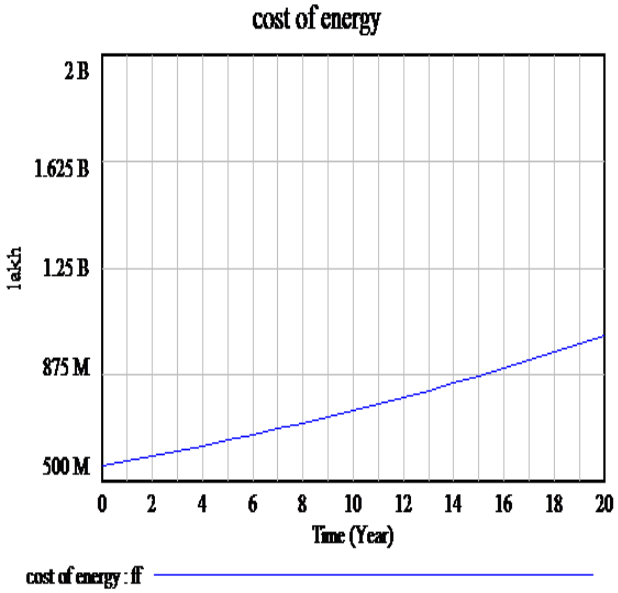

Figure 3. Showing the increased quantity of gasifiers for next twenty years

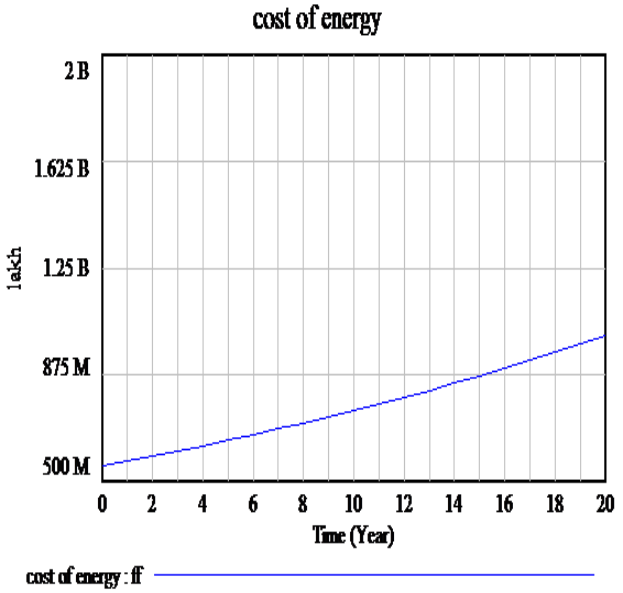

Figure 4. Showing the output in the form of money for next twenty years

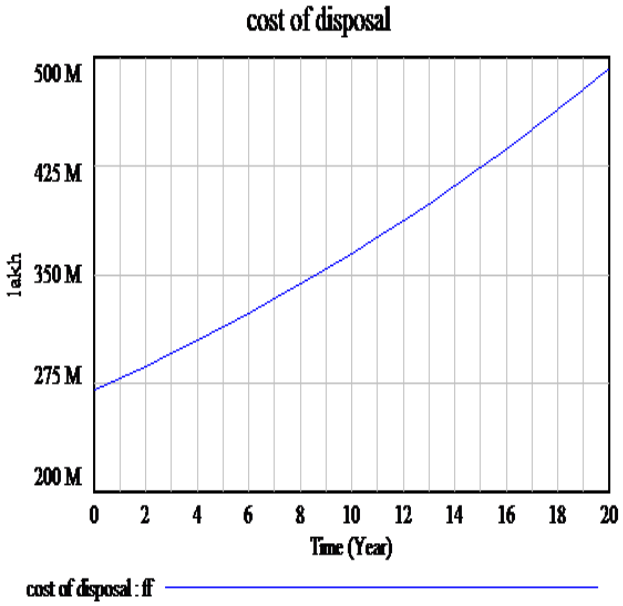

Figure 5. Showing the loss due to disposal in the form of money for next twenty years

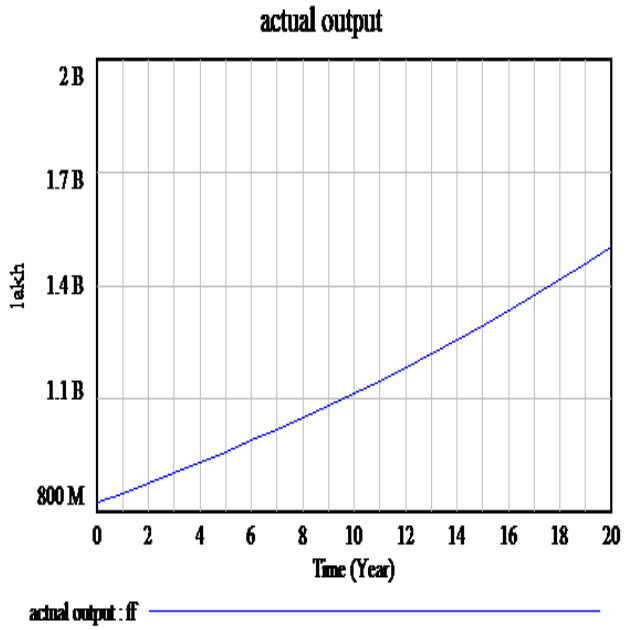

Figure 6. Showing the gross output in the form of money for next twenty year

2. Result

It is clear from output graphs that the production of organic waste will increase from 2.70 billion/Ton to 5.0 billion/Ton in next twenty years. This is a very huge quantity of organic waste. It will be impossible to get the land for its dumping in future. Therefore the quantity of gasifier should be increase from 377 M to 670 M in next twenty years. If this data is adopted for future then the cost benefit comes above 1.5 billion lakh due to energy produce and saving of amount for waste dumping, when gasifier is not in use.

IV. CONCLUSION

The application of gasifier saves our environment and produces energy. Therefore the above data is very important to accelerate the application of gasifier as keeping in mind that the increased population will be the major source of the inputs of gasifier and this application will solve the energy problem. This application also saves a lot of money in the case if disposal and it will be the source of money in terms of energy production.

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