International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 02 | Feb -2017 www.irjet.net p-ISSN: 2395-0072

Design & Fabrication of Organic Fertilizer Manufacturing Machine

Pruthviraj Pawar[1], Aniket Mahajan[2], Sumeet Pawar[3], Vineet Pawar[4], S.S.Pachpore[5], M.S.Bachhav[6]

[1,2,3,4] *Students, Dept. Of Mechanical Engineering, JSPM NTC Pune, Maharashtra, India*
[5]*Asst. Prof. Dept. Of Mechanical Engineering, JSPM NTC Pune, Maharashtra, India*
[6]*CEO, BKWT OPCLO Engineering Solutions, Pune, Maharashtra, India*

Abstract - *The use of organic fertilizer forms the backbone & basic necessity of a poor farmer. The traditional methods of using chemical fertilizers are not sufficient & satisfactory for increasing productivity of crop and to maintain the fertility of soil. Whereas the chemical fertilizers are more costly in market, so it becomes difficult for poor farmers to purchase it. Organic fertilizer manufacturing machine solves these problems. The raw material is introduced in hopper and further it is mixed with the help of stirrer. This mixture is then passed to another large sized agitation vessel where it is kept for decomposition for about 24 hours. When this mixture is completely decomposed further through filtration fertilizer is separated. In this way, this machine prepares fertilizer within 24 hours. A fertilizer manufacturing machine serves for various problems like moving from one place to another, requires less space & is less bulky as compared to the existing bulky machines. It also helps the farmers to start small business thereby making them self-dependent. Design & development of the machine is done taking into consideration various needs of farmers.*

Key Words: **Organic fertilizer, Productivity, agitation, Decomposition, filtration, Design**

1. INTRODUCTION

As India is developing country about 70% population lies in rural region. These people in rural region are dependent on agriculture as their main occupation. It is very essential to develop modern techniques to increase the productivity. While implementing modern technology some factors should also be considered such as: - the agricultural equipments should be provided to farmers at feasible rates, etc. In this era, agitation is one of the most fundamental operations in industries like paper, food, cosmetic, chemical, bio-chemical and pharmaceutical applications.

Our project is, to design and manufacture a machine which will be used for producing organic fertilizers for farmers without any use of electricity. These organic fertilizers will increase the productivity and quality of crops than any other conventional means, which are obviously harmful for human health, environment, land etc. Parts used for manufacturing such a machine are agitator, hopper, collector tank, bevel gear pairs, pulleys, flat belt drive and paddling mechanism.

2. PROBLEM IDENTIFICATION

Nowadays most of the farmers are using chemical fertilizers for their crops. Due to this the productivity of crops as well as the fertility of soil is decreasing day by day. Also, the prices of these chemical fertilizers are more to farmers.

Thus, it brings to our knowledge that the traditional methods are not sufficient and satisfactory for agriculture. Due to these, some major problems are identified & to over-come these problems some idea or concepts are developed and adopted. Following are the problems:-

1) There is no more scope for organic farming which is required.
2) The machines available for preparing organic fertilizers are costly which farmers cannot afford to buy.
3) Available machines are fuel consuming and operates at high power consumption which indirectly increases the cost.
4) Available machines are very bulky.

3. PROBLEM FORMULATION

The aim is to design & develop a low cost liquid fertilizer preparing machine which will help farmers to fertilize their land by their self-prepared organic fertilizer i.e. compost instead of buying costly and harmful chemical fertilizers which decrease the nutritive value of soil. We are going to design and fabricate such a machine that will eliminate most of the problems of farmers such as high cost of machine, more floor space requirement, high power consumption, requirement of electricity which is not possible in rural areas. So the machine will be designed & developed to reduce the human effort by introducing proper gearing mechanism, to make use without electricity manually thereby helping to earn more profit to farmers.

3.1 Concept

The motto to introduce this low cost machine is to increase the productivity of crops so that the farmers can get more profit and also maintain the fertility of soil. The concept of the work is,

1) Observe the previous methods & to identify the important process variables.
2) Quantify the important method.
3) Investigate all areas of farming methods.
4) Develop a prototype system which could control over all of the process
5) Produce a specification for a low cost system.

6) Refined design of the machine & fabricate the machine, as this plays a major role in rural area.

Considering the above points we design the organic fertilizer preparing machine which helps in replacing the conventional farming methods.

3.2 Objective

The Main Objectives Behind this project is:-

1) To prepare organic fertilizer to farmers at feasible rates.
2) To make the machine portable so as to be easily movable at any place.
3) To reduce the power consumption.
4) To make the machine in such a way that it can be used without electricity also.
5) To reduce the floor space required.
6) To make available the machine at low cost so as to make it affordable to the farmers.
7) To make sustainable use of agricultural & rural waste.
8) To increase the efficiency.
9) To make the farmers self dependent for their everlasting requirement of fertilizers.

4. WORKING PRINCIPLE

The schematic diagram of the machine is as shown in fig 1. The mixture is introduced in a small agitation vessel through hopper and is mixed with the help of stirrer. The mixture contains cow dung, jaggery, leaves and some amount of different pulses like toor, moong etc. The mixture is stirred well for its strong bonding in that vessel. Then it is fed to agitator by means of gravity and about 100 to 150 liters of water is added to it. In agitator, the whole mixture is kept for 24 hours for decomposition. In that span of time the stirrer is operated periodically for some time. Later the solid left over which is called as slurry is separated and the part which is remaining is in liquid state which can be used as fertilizer for agriculture. This process is called as filtration. The left over slurry can be further used for conventional or non-conventional means such as biogas preparation, direct fertilizers to plants or it can be reused for fertilizer preparation.

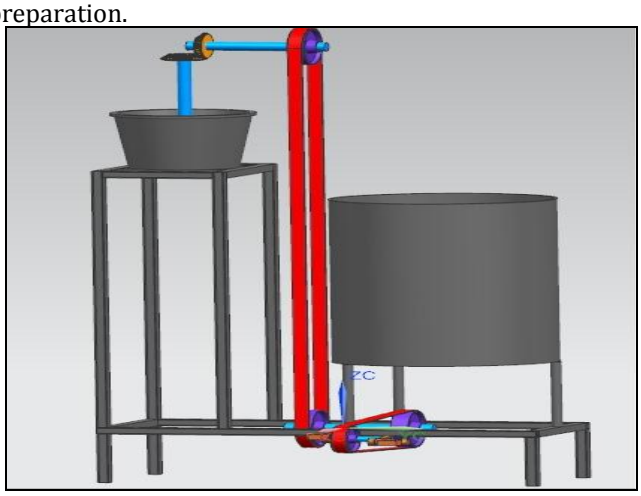

Fig -1: Natural fertilizer preparing machine

5. RESEARCH METHODOLOGY

The main research of any scientific investigation is to draw useful conclusion in light of objective of study. In order to get the meaningful conclusion, it is essential for investigator to adopt appropriate method and procedure, keeping this in view, to explain the methodology adopted, and to fulfil the objective of study. This chapter gives the detail report of the project.

As seen earlier, some projects are automatically operated (motorized) based. Existing project will be modified by making it as paddle operated (manual). Another problem is that for paddling more efforts are required for humans which become difficult for them. This problem will be removed by using the proper gearing mechanism wherever required to reduce human effort. Issues like heavy weight, power consumption, floor space, cost, etc in the existing machines will be satisfied to a great extent by reducing the weight of machine, reduced power consumption, less floor space, curtailment in cost, etc. As paddling (manual) operation is opted, farmers especially who lives in rural areas where there is problem of electricity can use this machine. The approach will be synthesis, design, development & testing of the machine. By keeping these points in our mind, we think of making such a machine, which is reliable to every farmer and is easy in its maintenance. The new and small scale farmers or business man can start their business as well as be self dependent for their everlasting need of fertilizers instead of totally depending on the chemical fertilizers which hampers the fertility of soil and also the productivity. Research methodology deals with design & fabrication of all components which are to be used in the machine with required modification. Firstly synthesis of all the problems which are related with project is to be done. After that, the design of complete machine & then regarding development is to be done on fertilizer preparing machine. Parameters will be selected according to the objectives. The various instruments used for fabrication of machine are to be mentioned. 2D & 3D diagrams of components, assembled machine and line diagrams are to be created with labelling.

6. CONCLUSIONS

Proper evaluation of the design is performed and created something even better. Finally we conclude that fertilizer preparing machine is better option to use by the farmer as its cost is low as compared to other machines. The machine is designed taking into consideration the various demands of farmers & other customers. Since this machine is made for small businessman or for farmers, therefore the work carried out by this machine is less. The capital required for purchasing the bigger size fertilizer preparing machine is very high & also the substitute way of using chemical fertilizers is also very costly. Also as this machine operates without electricity its cost gets reduced and becomes more reliable to small scale farmers.

6.1 Conclusions of the Project Work Are As Follows:-

1) This newly designed machine is compact and portable
2) Farmers can use the natural waste such as cow-dung, leaves etc.
3) The left over (slurry) from this machine can be further used for preparation of biogas which is an added benefit for farmers.
4) Productivity of crops increases by about 150 percent by using these natural fertilizers.
5) Highly skilled labours are not required.
6) Less area occupied by the machine

7. FUTURE SCOPE

Future scope of work is what is required to be delivered. It is importuned that future scope statement is clear unambiguous and easily to understand. It should also include details leaving the reader in no doubt what is being delivered as part of project. Following are the future scope of the machine:-

1) The manure which is remained can be used further for preparing biogas.
2) Provision for supplying the fertilizers direct to the crops via dripping can be done.
3) Provision of motor can be done instead of paddle where electricity is available.

This machine can help the farmers & small businessmen to be self efficient & dependent for their everlasting need of fertilizers thereby ultimately bringing an uplift in their own standard of living & economy.

REFERENCES

[1] Kevin J.Myers, Mark f.reeder and Julian B.Fasand, "Optimize Mixing by Using the Proper Baffles," 2012.
[2] K.M.Pandey and T.Sivasakthivel: "CFD Analysis of Mixing and Combustion of a Scramjet Combustor with a Planer Strut Injector," 2011.
[3] Joanna Karcz and Beata Mackiewicz, "An effect of the impeller position on the dispersion of floating particles in an agitated vessel," November 2009.
[4] Emmanuel Adeleke Fagbemi, Agbolahan Okeeseni, Baldwin Omonigho et al. "Forms and design analysis of mechanical shafts used in agricultural machineries," 2014.
[5] Shuo Hung Chang, Ronald L. Huston and John J, "Computer-Aided Design of Bevel Gear Tooth Surfaces," 1998.
[6] B. O. Akinnuli1, O. O. Agboola and P. P. Ikubanni1, "Parameters Determination for the Design of Bevel Gears Using Computer Aided Design (Bevel CAD)," 2015.
[7] V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publishing House.16-20, 1995.