# Design and Fabrication of A Model For Extracting Cattle Waste Pellets By Extrusion Method

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***Abstract-*** *In the village sector farmers prefer mixed farming, which involves both livestock and farming. In livestock they prefer cow more than anything as it provides milk and cow dung. Farmers usually stores the cow dung in open lands for many months before utilizing, which in turn loses its fertility by storing for a longer day. When the cow dung is placed in open field, the unwanted materials such as dust, a plastic gets mixed with cow dung. Before using one should need to clean it which is simply waste of time and money. So considering the above factors we have designed and fabricated a model in such a way that the cow dung is compressed and are extracted as pellets by supplying heat which can be used as manure in effective way or these pellets can be used as wood to burn which in turn saves many trees. One more application involves extraction of liquid which comes out while compressing the cow dung, which can be mixed with few chemicals and can be used as pesticides in farms. At last by using our product one can use the cow dung in optimum way.*

***Keywords***- Cow manure, chamber, fertilizer.

## I. INTRODUCTION

**T**he biomass is an organic material. It is obtained by plants and animals. In plants the biomass is obtained from wood, dried leaves and seeds. The saw dust of wood and dried leaves is used for domestic purpose and the seeds are used to produce biofuel. The biofuel is obtained from Jatropha, Neem seeds, Sunflower and Pongamia pinnata. In animals the biomass is obtained by its manure or waste. But there are few limitations they cannot be used directly, because they contain moisture content in them, so they do not burn properly and requires more space, so we convert animal manure into pellets by the process known as extrusion method by using pelletizing machine and driers. This process of extracting the cow dung with pellet by extrusion method we obtain bi products such as biogas, slurry and biomass pellets. As we all know that the present generation is mainly depended on the petroleum products such as diesel and petrol. But now a days the increase in use of these products have let to their depletion at a fast rate. So we are in search of an alternative method and to overcome these problems by using bio-mass and bio-gas. Petroleum products such as diesel and petrol are used in cars and two wheelers. The combustion of these petroleum products releases oxides of nitrogen, carbon monoxide, nitrite oxide, Sulphur oxide and lead vapor which in turn cause air pollution and environmental pollution which lead to global warming, acid rains which affects the life on earth, and which is harm full to human health. So in order to get rid of these problems we need to use bio fuel instead of those harm full petroleum products. The biomass offers clean fuel for energy.

## II. MATERIALS AND METHODOLOGY

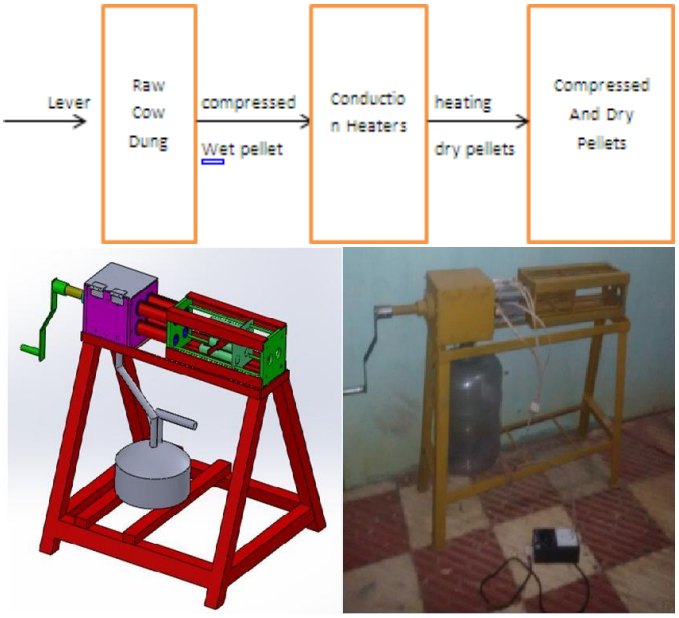


**Fig .1. Block diagram of design and fabrication for extracting cow dung pellets by extrusion method**

### A. Assembly

Our project consists of basically three chambers and a base. The fig 1 shows complete assembly of pelletizing machine, Chamber one is a hallow cube in which at one side a worm thread with Allen key is present at the center, at another end of worm thread a square slab is present which helps for compression in chamber one. Chamber two consists of four hallow cylinders which is placed in between the chambers one and three. The hallow cylinders receive the output from the chamber one, it is provided with a heater on top of it which

can be regulated. Chamber three consists of a guide way and four hallow cylinders with the size just a smaller than those of the cylinder in chamber two and is inserted in it, which helps to take out the output from chamber two after heating process Working Principle

Design and fabrication for extracting cow dung pellets by extrusion method is consists of 3 different chambers.

### B. Chamber 1

**Fig 2. Cow dung**

**Fig 3.Cow dung instrument**

Frame or body is used to fill the cow dung manually or automatically depending on quantity of cow dung used or size of the machine. And then the filler cap should be closed so that the cow dung doesn't move out of the chamber, when the lever is rotated. And again, when the worm is rotated by using lever the helical square thread which moves in forward direction and once it reaches the dead point we have to rotate the lever in anticlockwise and it returns to its initial position. Finally, it is ready for next cycle.

The worm has helical square thread in which one end of worm is connected to the rotating wheel and other end is supported to moving plate with the help of radial bearing

### C. Chamber 2

After the first chamber process the compressed or squeezed cow manure is taken to the second chamber then it is moves through the circular shaped die pipe. The cow dung is filled in another slotted die with pipe. This pipe is inserted into another large pipe. This pipe is pushed into the second chambers die pipe from the chamber by using the guide ways or guidelines. The slotted pipe is attached to another moving plate, which works with the help of guidelines or guide ways. This slotted die with pipe is made to maintain lesser diameter compare to second chamber circular die pipe of 2-3mm diameter because of easy movement of inward and outward action between both second and third chamber die pipe. The second chamber circular shaped die pipe is not containing any slotted space on the pipe surface because the pushed or squeezed cow dung or manure remains their only. If we make slotted on second chamber die pipe, then pushed or compressed cow dung is directly go out waste from slotted pipe. So this problem or drawback is avoided by using die pipe on second chamber and slotted die pipe at third chamber die pipe. The pushed or compressed cow dung from first chamber moves towards die in both second and third chamber die pipe with and without slotted die pipe. This cow dung is again taken out to the third chamber by using guide way or guideline which supports moving plate by pulling action, then third chambered die pipe is separated from second chamber. This is again taken to removes the water content or moisture level in cow dung by using heater.

### D. Chamber 3

After the second chamber process the cow dung taken from bigger die pipe to smaller slotted tube or pipe this slotted pipe makes help of quick and easy removing of pellet, in this the cow dung pellet is taken out from the slotted pipe by using another small size of moving plate which is made to fitted inside the slotted pipe. This dried pellet is taken out from tube or pipe by using the keys and slotting on the pipe. The keys are having easy movement in a slotting pipe.

## III. RESULTS AND DISCUSSION

### A. Experimental Test and Result

The dry cow dung pellet by fully assembled extrusion type of Palletization machine, this specimen is takes to carry out some experimental test like density, hardness number and calorific value finding.

### B. Density Test

After the preparation of the specimen of the dry cow dung pellet is taken to weighing a pocket scale calibration weighing machine.

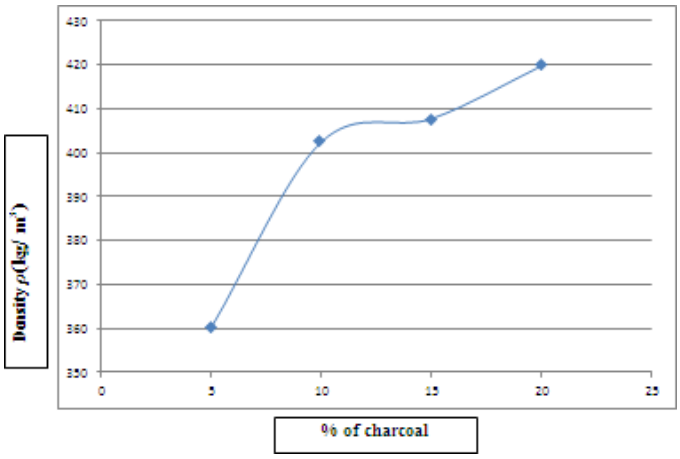


**Fig 4. Density V/S Percentage charcoal in Cow Dung Pellet**


**Fig 5. Density Tester**

### C. Hardness Number

B-Scale mold hardness tester, the hardness number is determined by using "B scale mold hardness number tester ". It is like brinnel hardness number, in brinnel hardness number the experiment is carried on table work. But in the in the B-scale hardness tester the hardness of specimen is measured in hand. In this type of experiment the obtained specimen is handled manually and using the B-scale instrument slightly apply the pressure on the specimen then note down the pressure reading of the specimen which is indicated in the dial.

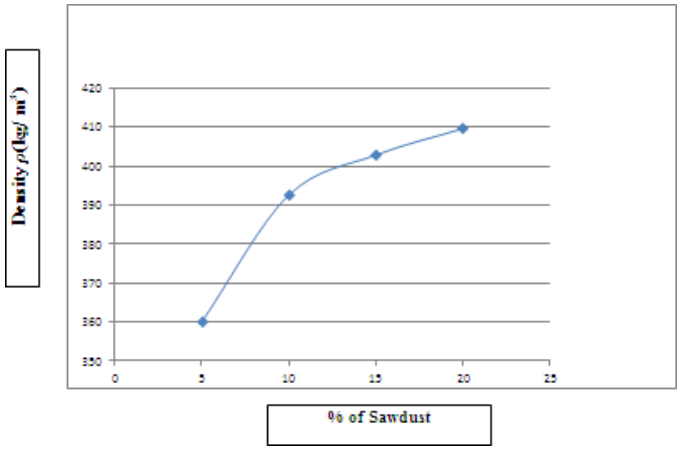


***Fig 6. Hardness Number V/S Percentage Sawdust in Cow Dung Pellet***

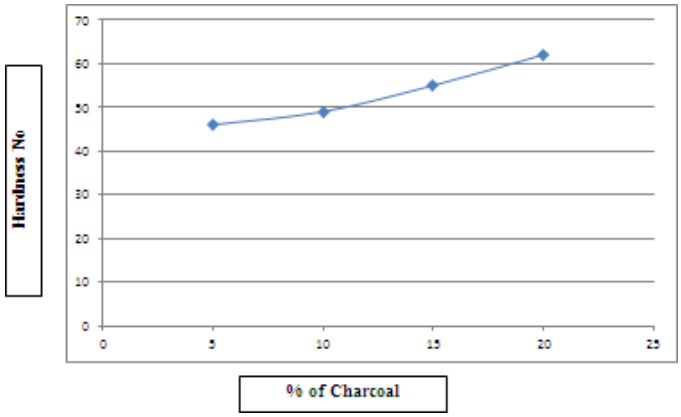


**Fig 7. Hardness Number V/S Percentage of Charcoal in Cow Dung Pellet**

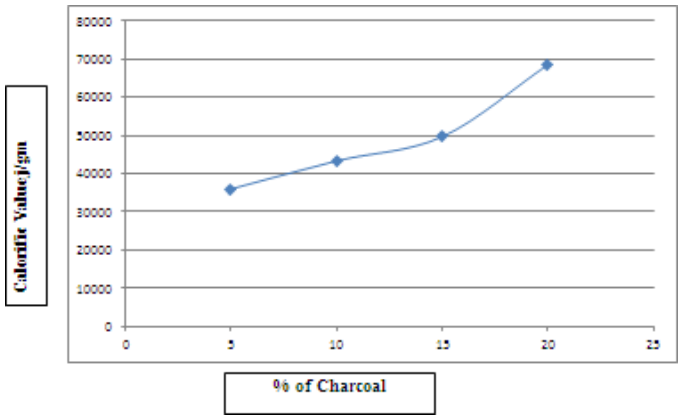


**Fig 8: Calorific Value V/S Percentage of Charcoal in Cow Dung Pellet**

Figure 8 shows the obtained calorific value of cow dung pellet with different percentage level of sawdust. The caloric value is slightly increased by increasing of mixing level of saw dust with cow dung. Figure 8 shows the increased level of calorific value of cow dung pellet with mixing different percentage level of charcoal. The caloric value is

slightly increased by increasing of mixing level of char coal with cow dung

## IV. EXPERIMENTAL SETUP

The schematic of experimental engine test rig setup used for evaluation of performance, combustion and emission characteristics of hybrid fuel at standard operating conditions is shown in Fig.1

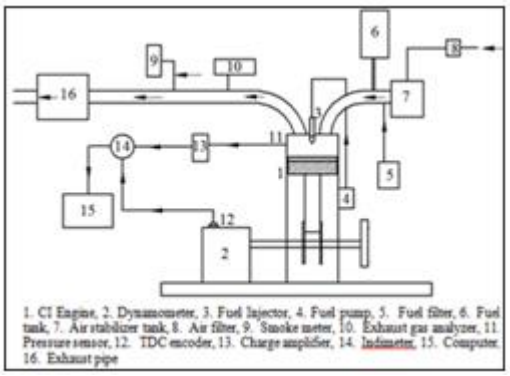


**Figure 1: Line diagram of experimental setup.**

Technical specifications of the engine setup used for present study are given in Table 1.

**Table 1: Engine and dynamometer specification**

| Parameters | Specifications |
|---|---|
| Type | TV 1(Kirloskar Made) |
| Nozzle opening pressure | 200 to 225 bar |
| Governer type | Mechanical centrifugal type |
| Number of cylinders | Single cylinder |
| Compression ratio | 16.5:1 |
| Bore | 80mm |
| Stroke length | 110mm |
| Dynamometer | Electrical |

## V. CONCLUSION

In this work, extrusion type Palletization machine was developed and evaluated for maximum operating load condition along x, y and z direction.

- The Palletization machine with the designed dimension was fabricated as per requirements.
- More skill is not required to operate this machine.it is easy to operate.
- It increases the nitrogen level of fertilizer, since there is no loss of $N_2$ because we are not storing it in open field.
- We can use it as combustible fuel and organic fertilizer.
- Handling of cow manure is standardized.
- We can avoid some deceases which are caused by mosquitos and other small insects.
- There will be reduction in labor cost, when compare with present method.
- By adding saw dust / charcoal powder in small percentage, cow dung pellets can be used as fuel.

## VI. ACKNOWLEDGMENTS.

Avoid expressions such as “One of us (S.B.A.) would like to thank ... .” Instead, write “F. A. Author thanks ” *Sponsor and financial support acknowledgments are placed in the unnumbered footnote on the first page*.

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**Karthik.S** is currently working as an Assistant Professor in REVA University, Bengaluru-64. His areas of interest are in designing of sustainable products for agricultural purpose. He has completer M.Tech in Machine design and has more than 3 years of experience in academia and published 3 scopus indexed journal and attended 3 international conference and 2 National conferences and won best paper award in national conference..

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