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Cattle Feed Pellet Making Machine from Agricultural Products

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Abstract: With increasing emphasis on self-employment as a means of improving the standard of living.. The pelletizing machine is mainly used for supplying required nutrients to animals and poultry feed. There are high cost machineries available in the market. Our aim is to support the small scale producer with economized machine to increase the rate of production and rate of supply. It is driven by electric motor makes it more energy saving and environmental friendly. The experimental work was carried out by testing the machine and operation capacity was found to be 250kg/hr. Raw materials are mixed together in the oily form and feed into pellet machine. This paper represents the design, fabrication, development and testing of a cheap electrically operated pellet machine with locally available materials and promote their business well in the field.

Keywords: pelletizing machine, poultry feed, electric motor, design, fabrication, development

I. INTRODUCTION

Cattle feed is the fastest growing livestock sector in both the developing and developed countries. Pellet is been used for feeding for fishes, cow, goats etc. the main aim of our project is to provide an low cost pellet for the farmers. Our machine is mostly useful for the farmers owning cow farms. Raw materials are been made into homogeneous mixtures in form of tiny particles. Blending process is been carried out for the mixing of homogeneous mixture with oil. This mixture is been poured into the pelleting machine. Where roller press compression is been carried out for making the homogeneous mixture into the form of pellet into the required shape and size. Shape of the pellet is been determined based on the holes present in the die plate.

Table 1 :Pellet size for animals

Animal Pellet	size Dia.(mm)
Fish	1.5-2
Poultry	3-4
Goat	8-10
Cattle	12-13

Considering the high cost of pelletizing machine available in the market. The attempt was made to design optimized pelletizing machine at low cost to provide alternate solution for Indian Farmers of in house production of pellets. Various types of raw materials which are been used in pellet process are wheat, corn, soya beans, are been mixed together and feed into pellet machine for pellet manufacturing process. The techniques that have been in use are grinding or particle size reduction, crushing, rolling, steam-flaking, micronisation, roasting, chopping, cracking or crimping, popping, hot and cold pelleting. The pelleting equipment have been classified into two, based on the type of die: the disc die and the ring die pelleters .

II. LITERATURE SURVEY:

Vaidya S.V (2001) [2] in his paper, "The Indian feed industry" involving analysis of the feed industry in India has discussed in detail about the livestock industry in India, its growth pattern, issues connected with this industry. Accordingly, strategies that are suitable for counteracting these issues are suggested.

John M P &Manoj P K (2013) (b) [3] in their research paper have made a detailed analysis of the dynamics of cattle feed industry in India with a focus on Kerala state. Feed consumption pattern, composition of the cattle feed market, pattern of cattle holdings vis-à-vis feed consumption, milk-yield vis-à-vis use of branded cattle feed, factors influencing purchasing decisions etc. have been studied. The paper has suggested strategies for effective marketing of cattle feed and hence increasing the market share.

III. MATERIAL AND PARTS USED:

To obtain good finishing and accuracy, various tools and machines were employed during the fabrication of the machine. They include the lathe machine, welding machine, drilling machine and bench work tool. The feeding Hopper was constructed by cutting 3mm thick mild steel into fine trapezoidal plates and the edges welded together. The shaft and screw conveyor are made of mild steel rod turned to 25mm diameter. The barrel is made of a 74mm diameter stainless steel pipe and the length 305mm cut out of a large pipe. It houses the screw conveyor. The frame with height 510mm, breadth 240mm and with 400mm width made of steel was cut using hacksaw and welded together. The disk plate attached to the barrel. The barrel is a circular component made up of twenty-eight holes of 3mm each through which the turned feeds extend through in pellet form. Mild steel has found applications in various other locally available fabricated machines.

Various components which are been used during manufacturing of machines are listed below.

Table 2: Specifications of Material

s.no	components	Materials used
1	roller	SAE 1030
2	die	Alloy steel
3	Transmission shaft	Plain carbon steel(MS)
4	hooper	Galvanized sheet tin
5	frame	Mild steel angles
6	motor	Electric
7	knife	Ms

A. The Frame

The frame acted as a support to other components. It was a rigid structure and was designed to withstand dynamic stresses. Welded to the base was the bearing support. The barrel was also welded to the vertical part of the frame.



B. Barrel

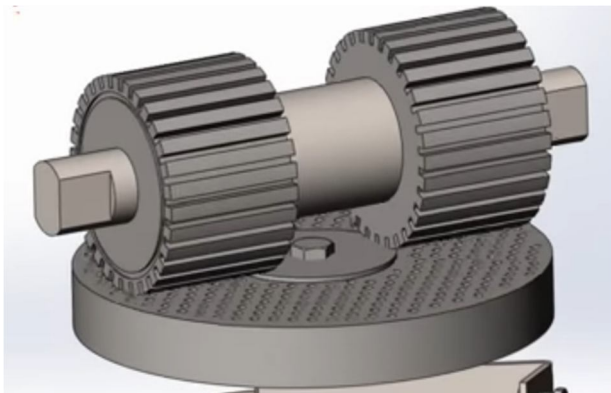
The barrel is a cylinder with internal diameter of 80 mm and thickness of 5 mm. It has a length of 300 mm. A flange was welded to the end of the barrel to support the die plate.

C. The Hopper

The hopper is a funnel shaped frustum cut out of a square pyramid. The height of the frustum is 150 mm and it has a square top of length 200 mm.

D. The Die Plate

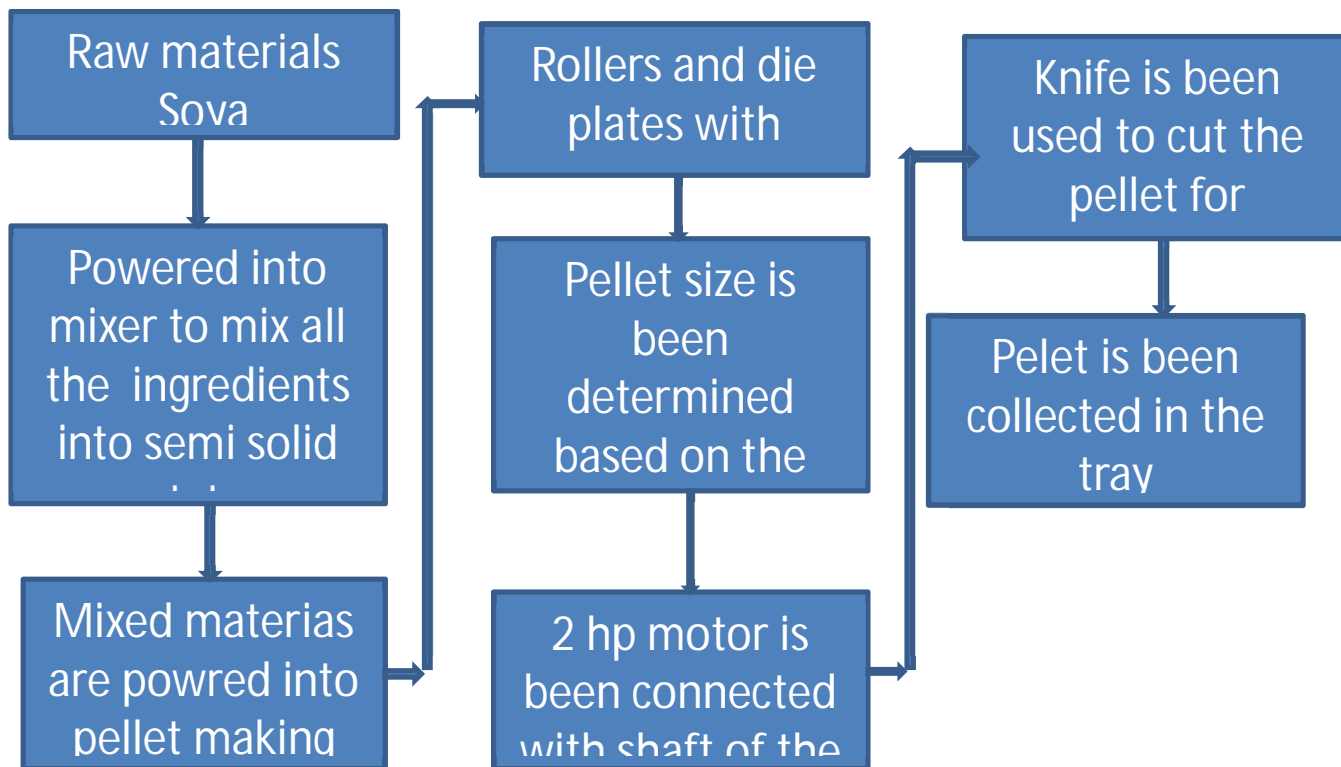
The pelleting die is required to restrict the flow of feed material and provide the cylindrical shape of the pellet. The die plate had a thickness of 5 mm. The effective diameter of the die plate was 80 mm. Thirty-six die inserts of 8 mm were drilled into the plate.



IV. WORKING

- A. Raw materials are collected in the mixing chamber.
- B. Grinding wheels are used to grind the particles and make it into powdery form.
- C. Pellet are manufactured using die and it is sent out through outlet tray.
- D. 2Hp motor is used for operating the machine

WORKING



V. ECONOMICS

- A. We have considered that a group of 5 farmers, having a medium scale farm, generating waste of the amount 5 kg per day on each farm, will invest in one machine collectively.
- B. For four hours a day, the machine will have to process 6.25 kg of waste per hour.
- C. No. of pellets produced = $440 \times 0.8 \times 45 / 1.5 = 10560$ pellets.
- D. Effective cycle time = $60 / (10560 / 440) = 2.5$ minutes. (Considering 80% of material passes through the holes).
- E. The various costs for the machine are as follows:
 - 1) Total cost of the machine $C_o =$ Rs. 45000.
 - 2) Cost per pellet $C_B =$ Rs. 0.0071 (Rs 12/kg).
 - 3) Estimated monthly sale $S_M = 25 \times 20 \times 12 =$ Rs 6000.
 - 4) Estimated annual sale $S_A = 6000 \times 9 =$ Rs. 54000.
 - 5) Cost of raw material $C_1 = 0.1$ kg binder/ kg of pellets $\times 25 \times 4 \times 20 \times 9 =$ Rs. 1800.
 - 6) Cost of electricity per year $C_2 = 0.746 \times 4 \times 20 \times 12 \times 2 = 720$ units/ year $\times 2 =$ Rs. 1440.
 - 7) Cost of maintenance per year $C_3 = 200 \times 12 =$ Rs. 2400.

$$SPP = C_o / (S_A - C_1 - C_2 - C_3)$$

$$= 45000 / (54000 - 1800 - 1440 - 2400)$$

$$= 0.9302 \text{ yrs.}$$

i.e. 11.16 months Hence payback period is around 11 months.

VI. ADVANTAGES

- A. Simple structure and cost efficient
- B. Small area coverage
- C. Automatic machine and less time consuming.
- D. Spare parts are easy to change.

VII. ASSEMBLY AND DISCUSSIONS

The main components are hopper, roller, rotating die, chamber, frame, gearing arrangements, and electric motor. The feed to be converted in pellets is introduced into the Hopper and this flows down into the pelleting chamber by Gravity flow. The die is connected to the shaft which with the help of gearing arrangements is connected to the electric motor, thus rotation of die is done with the help of electric motor. The rotation of the die initiates the rotation of the rollers which pick up the feed material and compress it into the die holes to form pellets. The emerging pellets are cut by a knife and discharged through the pelleting chamber to the discharge tray by a tangential force of the rotating die. The pellets are collected into a bowl and sun-dried





VIII. CONCLUSION

This machine can be commercialized for domestic use, Agriculture field, and cow forms. Our main objective is to manufacture pellet machine at low cost and make it available to all the small scale farmers. This machine has an capacity of manufacturing 250 kg/hr. this can increase the profit rate of the farmers. The machine has a capacity which suits its purpose but can be improved and modified to reduce the specific power consumption. The machine can be fabricated affordably at small workshops or machine shops in developing countries.

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- [1] **Sinha, Abhishek** (2000) [1] has made an elaborate discussion on the current status, problems and challenges of cattle feed industry in India. The growing trend and favourable macro-economic and demographic factors resulting in bright prospects of the industry etc. have been discussed by the author
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