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A REVIEW ON DESIGN AND DEVELOPMENT OF COW DUNG LOG MAKING MACHINE

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Abstract

Paper presents development of machine used for making a log from Cow Dung. Use of bio-mass as a renewable energy source widely increased. The application of cow dung log in various purposes like for manure, cooking and heating of boiler chamber. In rural India from ancient time cow dung cakes are produced by using hands. But this process is more time consuming and low production rate activity, it is necessary to use alternative source of energy for making cow dung log. Paper aims to compare and review on available cow dung log making machine and propose to use a alternative source of energy i.e. cow dung log making machine energized by Human Powered. It provides gainful employability and capability of earning to the people of rural & urban area in the interest of economic development.

Keywords: Log Machine, Human Powered, Cow Dung, Renewable energy.

1. INTRODUCTION

Being the first ever energy source to be harnessed by human is wood fuel which can be used in various forms for the purpose such as cooking, heating or drying things, making ceramics tiles and bricks and generating power. However wood has some disadvantages as well. Burning of wood produces soot, smoke and ash which cause air pollution. Additionally wood are also non-renewable resources considering that reduces space for tress due to urbanization projects. So its consumption needs to be carefully monitored and there is need to find alternative source that will no causes much pollutant but could provide same function as wood. So cow dung can be used as alternative source for fuel. India in rural area or in Goshalas, the traditional method of making cow dung log by hands which is more time consuming and low production rate activity. Cow Dung is used in agriculture such as manure, bio-fertilizers, bio-pesticide, pest repellent and as a source of energy fuel. In India as a agricultural country produces large quantity of agricultural waste every year. So use of this waste for making log or briquettes as a bio mass can be beneficial as eco-friendly solution as well as economically feasible and sustainable. For initiate burning of fuel need to supply cow dung log so that burning problem easily sort out. Also cow dung log being light in weight and equally effective and when it comes to generate heat, log emit less smoke and retain heat for long time [1]

2. LITERATURE SOURCE

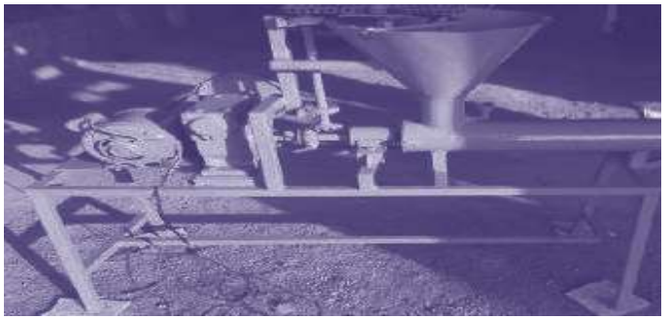
The problem associated with handmade cow dung log was improved by using different kind of mechanism. In the field of cow dung log making machine, researcher worked on the machine powered by electric motor in the range of 0.5 to 5 Hp. The some of the contributors are:

S. Kannaki et al. (2020) made a machine operated by automatic system to increase the production rate minimize with human effort. This machine worked on mechatronic concept based on mechanical electrical and control system mechanism. Input devices used as sensor and output devices used as motor and controller. To start and actuate the motor input signal is given by controller. The main components of this mechanism are hopper, motor, screw conveyor, drum and bearing with gear box and coupling. Cutting blade is used to cut logs as per requirement. The extrusion and cutting process of log is fully automatic which means independent from manual operation. This machine is ease to assemble and cost efficient with minimum power requirement for operation. But for operation of machine skill person is required and in remote or rural areas where problem of electricity this machine is not affordable. [2]

Mayur Gosavi (2020), made a semi –automatic cow dung log making machine with modification in hopper shape which is conical shape. Due to conical shape mixture is easily slide down into cylinder. Other modification made is that inside hopper mixing blades are provided to overcome problem of ramming. This blade gets rotated as machine started. For the rotation of blade used sprocket and chain arrangement. Power is taken from gear box by means of Bevel and for free rotation and reduction of friction bearing is used. Also done modification in grinding unit, used a vertical spiral just below the hopper. The spiral is attached to mixing blade rod. The purpose of spiral is to push mixture into horizontal cylinder. Conical shape outlet gives better compressive and bonding of the particles which gives some strength to the log. This machine works on semi- automated concept involved with mechanical, electrical and control system. This is Future scope of this machine is

that to meet uncertainty of electricity & power supply in rural and interior area, use of solar energy or other form of energy independent form electricity is best ,cheap and eco-friendly solution.[3]

Fig 1. Automatic cow dung log making machine



Musthak I. Ansari et al. (2020) developed cow dung stick manufacturing machine for produced cow dung stick with minimum human effort. Stick was made by using various types of agricultural waste and mix with cow dung. For these manufacturing used 0.5 Hp electrical motor. Mixture is poured into the hopper. A screw mechanism is provided for mixing raw material thoroughly, compresses it and extrudes it. Desired shape and size sticks are produced with help of specified size and shape of die. Moisture present inside logs are dry out by explore the sticks in sun light and sticks make hard and sturdy. As compared to coal and other fuel, this produced stick has good calorific value. Due to good calorific value, after stick burning the formation of dust and ash is minimum. This machine developed at low cost and maintains the quality of sticks. [4]

Fig 2. Model of machine

Arjunbhai Patel (2018) made innovate in machine operated by electrical power for making log from cow dung for cremation process which is environment friendly. This machine is capable of making 3 logs at a time and also produce 100/120 logs in an hour. Dual application of this machine by changing die, the machine can be used for making logs as per the requirement. A narrow cylindrical opening has provided across the length in centre of log for easy drying and efficient combustion. By using slurry from biogas which is mixed with straw and any other harvested crops residue, log is made. So it is better utilization of agro waste and it is economical application. [6]

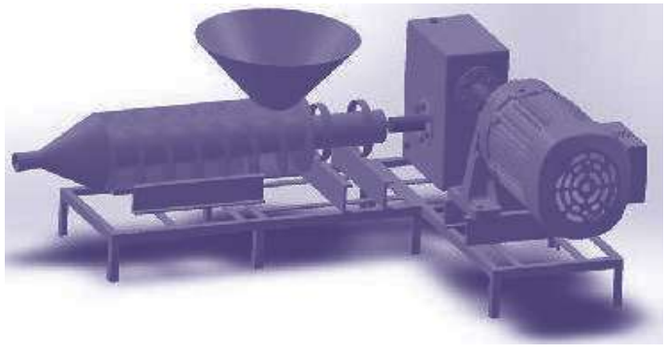
Fig 3. Cow dung log making machine

Mansukhbhai Prajapati (2013) developed cow dung long log making machine with minimum human intervention. This cow dung log making machine operated on electricity with 2 Hp motor and capable of making 50 to 60 logs per hour. In this mechanism a hopper is used where raw material as cow dung and straw (agricultural waste) is poured. The compression of raw material and extrusion of log is carried out by using screw mechanism. Logs of desired shape and size are made by using die as per desired shape and size. These logs are ease to handle and storage and economical for transportation. It also minimizes the wastage of material. [7]

Fig 4. Cow dung log making machine

K. R. Kapadani et al. (2020) made development of Screw Briquetting machine for compaction of Bio-mass obtained from agricultural waste and improve the C.V. by testing of various compositions of briquettes. They manufacture machine which replace use of fossils fuels such as kerosene, coal pollution making material. By using agricultural waste product manufactured Bio-mass. In this mechanism motor shaft is connected with screw and coupling. This power transmission used for screw propeller which gives forces to material. At the end side of screw propeller mounted a die and hopper. The raw material used for making briquette is sawdust, rice husk, coffee husk, and sugarcane and bamboo dust and binding material used as clay, starch, gum. For the operation of machine used 1.5 Hp single phase motor with 1500 rpm. [9]

Fig 5. Model of Biomass Briquetting machine



K. S. Manjunath et al. (2018) made a briquette making machine form solid waste by using electrical power. The raw material is used for making briquette such saw dust, coffee husk, dry leaves and rice husk. For production of compact briquettes as per required ratio of raw material is fed into hopper. And due to rotation of blade these mixture moves out and grinded. The speed of blade and grinding process is controlled by using regulator. Then these materials are pass through sieve plate. After pressing these materials it converted into slurry by mixing water and binder and compact briquette is produced. A 250 Watt, 230 volt and 1400 rpm AC motor is used in this machine. The benefits of making briquettes from waste are environmentally with

economical feasible solution. [5].

Y. M. Sonkhaskar et al. (2018) developed the low cost manual operated briquettes making machine with minimum cost. This machine worked on the concept of Scotch Yoke mechanism which converted field waste into a useful product. There are various alternative sources are available to produced briquettes from loose biomass different types of presses. These presents machines are very costly and large in size and are commercially applicable to industries. So in rural areas made a machine by using Scotch Yoke mechanism. It consists of two sliding parts and two revolute pairs. It converts rotary motion into reciprocating motion. Compression chamber is used as simple cylinder in which raw material is compressed by piston. A hopper is connected with inlet of compression chamber and ejector ports are used for ejecting briquettes form compression chamber. This mechanism can be automated in future scope. [10]

B. S. Kishan et al. (2016) have made briquetting machine which is low cost and evaluated calorific value of produced biomass briquettes. These machines consist of three section such as grinding, carrier and compressing section. In Grinding section there are hopper, electric motor, grinder blade and sieve plate. The raw materials used for making briquette are saw dust, coffee husk. In hopper is produces briquettes so increases production rate by using A.C. motor of 750 Watts with 18000 rpm. In carrier section there are guide ways and sliding member which is used to guide sliding member. So that sliding member move easily in specified path carries grinding raw material form hopper to cylinder. Compressing unit consist of Jack, cylinder and piston. Jack is used for drive the piston inside the cylinder. The grinded raw materials are carried out into cylinder and then compressed into briquettes by application of jack force. These formed briquettes are exit out by pulling the plate at top of cylinder. In future there is need to find a way to replace motor which required electricity for grinding purpose. So it can be use in remote areas. [12]

Hafiz M. Safdar et al. (2020) made a machine for making briquetting from crop residue by piston press mechanism. This piston press briquetting machine consist of hopper for feeing raw material, conveyor for extrusion and tapper die, two fly wheel, connecting rod, main motor for power transmission to one of the flywheel and long air coolant line. To operate machine used 26 KW electric motor for production of 300 Kg/hr briquettes. [13].

Rahul A. Patil et al. (2021) made briquettes from dry sugarcane leaves and press mud, cow dung, buffalo dung as binder. Weight of dry sugarcane leaves and mixes binder cow dung, buffalo dung and press mud is taken by using weight balance machine. Mixture is filled then load was gradually applied to sample and operated with high speed load. After the removal of sample from the die, briquette was separated. They conducted experiment for various weight ratio of dry sugarcane leaves to binder and optimum weight ratio was chosen depending upon briquette formation. From their experiment result it was found that for making high quality dry sugarcane leaf briquettes, Cow dung is better binder. [14].

M. A. Fajobi et al. (2020) make a development in pedal operated washing machine by using human powered. This machine had developed with various ports assembled together using galvanized steel to achieve machine fabrication. This machine is easy to use and low cost of maintenance at long run, energy sustainable and also it is eco-friendly. [19]

Fig 6. Model pedal washing machine

A. J. Deokar et al. (2019) made human powered forklift. The structure frame are formed by welding the steel square bar. A fork is made in front to lift a load up to 100 Kg. Tripod steering system is used to gives direction for wheels. Forklift are rated for loads at a specified towards centre of gravity. The machine is provided with chain and paddle mechanism for easy movement of machine and helpful for easy operation of machine. The turning of wheel is carried out by using handle wheel and chain sprocket mechanism. For easy lifting of substance the motion is given by using the paddle wheel and chain sprocket mechanism. Its future scope is that to maintain capacity of carrying weight and load the device made large in size so that it can used in any engineering industry or application.[18]

Vijaykumar S. Shende et al. (2019) made a concrete mixture by human powered flywheel motor. In this concrete mixture machine five shafts are used. By peddling, energy is transmitted to flywheel. After certain time period sufficient amount of energy is stored in flywheel. The machine is operated by using this stored energy. By engaging clutch and energy is fed to concrete mixture through gear.[17]

Fig 7. Pictorial view of concrete mixture energized by human powered

Yash Hiragar et al. (2018) developed peddle operated multi-purpose machine which is used for application Grinding and Drilling. Electrically driven machine are mostly heavy weighted and cannot be used as mobile use and only used for single purpose. So developed multi operated manually driven machine. In this mechanism consist of belt drive, chain drive and sprockets arrangement. By pedaling process human power is converted into mechanical energy which is used for making operation like grinding and drilling. This machine is to drill hole in wood and to grind mild steel .But main disadvantages is that for operation consume more times as compared to electric motor and not used for mass production .[20]

Fig 8. working model of proposed machine

M.S. Giripunje et al. (2016) developed human powered operated Food grain crusher. In this they use human power up to 7hp by using bicycle arrangement which consist of clutch and transmission system. These systems consist of large number of process unit. The machine operated without fatigue and smoothly for longer period of time. [21]. Result of the literature review shows that no author has worked on the cow dung log making machine operated by human power. In earlier electrically operated machine, problem is faced due uncertainty of electricity and power cut. In India in rural and interior areas there is shortage of electricity. Also researcher and engineers across the world are in the search of alternative fuel with minimum consumption of natural resources. It is necessary to search alternative source of energy to operate machine, due to increasing cost of fuel, availability of electricity and problem of global warming. To meet uncertainty of energy supply and power cut, propose to design and developed the cow dung log making machine energized by human powered (HP). Also from the literature review it found that human powered used for various application. So focus on to select and develop method for power transmission form human to processing unit. For this an idea in our mind that as an alternative source peddle operated mechanism can be used for power transmission. Hence propose a cow dung log making machine energized by Human Powered. For this purpose use alternative like peddle/ handle operated mechanism by using bicycle power for input work. Based on the power required to operate the mechanism, we can select and develop the alternative method energized by human powered mechanism. And developed die for making hollow logs. As hollow logs are more helpful for easily burning of fuel. Also analyze the performance of logs by testing the properties like C. V. of Cow Dung log and ash characteristic.

3. METHOD

Main component of proposed mechanism are: Hopper (Conical shape), Drum (collect dung), Screw conveyor, Bearing, base frame, Die for hollow log and alternative mechanism for power transmission from human to processing unit. Power transmission unit will be consist of pedal operated sewing machine mechanism. For efficient compression of raw material will select proper screw conveyor and design a Die for making hollow log.

4. WORKING

Cow dung almost 3 to 4 days mix with coal or wood powder as per utility will processes in human powered operated cow dung log making machine. This mixture filled in the hopper through which it is supplied to the screw extruder and energy supplied form pedal operated mechanism unit. The mixture is processes with the screw blade are transmitting to the die to make hollow log of appropriate size and shape of cow dung log. Hollow log will be produce to minimize smoke formation and burn effectively which will prevent health problem. These hollow logs can be used as a fuel for cooking food and for other purpose such as Havan (Homa), industrial activities, fuel used in boilers for producing steam, Brick Kiln.

Fig. 9. Model of proposed work

5. BENEFITS TO SOCIETY

1. In general cow dung generated in cow sheds are disposed of in nearby water bodies and causes water pollution. Reusing cow dung reduces this kind of water pollution.
2. Using cow dung logs does not require deforestation for the purpose of fuel wood .So tree cutting for heating / cooking purpose can be avoided in rural areas.
3. Burning cow dung logs also generated less particulate matter, less percentage of sulphur dioxide, less carbon monoxide as compared to burning of wooden logs and overall causes less air pollution than if wooden logs were used
4. Cow dung logs are also meant to be used in smaller quantity than wooden logs so they are quite cost effective.
5. Manufacturing cow dung logs also generate revenue for cowsheds and provides care for several cows in nearby areas there by promoting domestic businesses.
6. This machine made logs can solve the storage and transportation problem which was faced earlier in case of traditional method of making logs.

6. RESULT AND DISCUSSION

A comparison can draw from above literature and found that available cow dung log making machine operated by electrical energy has required electrical power and skilled person for operation and maintenance. This kind of mechanism is not useful in rural or interior areas were limited supply of electricity, electrical power cut problem or no power supply. Also available machines are costly and not affordable for rural areas people. Whereas our proposed cow dung making machine energized by human powered will help to by promoting cleanliness and hygiene by eliminating solid waste from the region and also creating employment opportunities for their livelihood. Lot of awareness is being created by the central government and state government for implementation of such projects in the society and cow dung waste is been treated at minimum cost with minimum human energy consumption, which contribute to Swatchh Bharat Abhiyan. By enforcing this technology in rural or interior areas can enhance the unskilled or semiskilled labor. It increases the productivity of the people engaged in the production of cow dung log in rural area This machine replaces the motorized unit which surely open an avenue to generate employment for people in rural areas. It provides gainful employability and capability of earning to the people of rural and urban area in the interest of economic development. Also, use of clean and free source of energy, reducing the dependency of electrical energy which presently obtained from conventional sources, which is costly and causing degradation of environment.

7. CONCLUSION

As cow dung log making machine operation can take place by means of Human Powered, therefore it is bound to be commercially and economically viable in rural as well as urban areas. The cost of this Human powered operated machine should be minimum as compared to other electrically operated cow dung log making machine which can afforded to rural areas people. The machine is simple, ease of operation and maintenance. Machine energized by human powered means no need of electricity which is environmentally friendly and is justified as an original future contribution.

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