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SAWDUST BRIQUETTING PRESS MACHINE

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ABSTRACT

This paper explains the designing, fabrication, and automation of a biomass 'Sawdust Briquetting Machine'. Sawdust when used in form of Briquettes gives more energy, produces less ash and is easy handle and possessless harm to environment as compared to Sawdust. By keeping in mind all this aspects the machine is developed to produce Sawdust briquettes. The production cost was found to be lower due to the lower moisture content of the feed stock required for this machine is lower by about 30% compared to the best alternative, which results in shorter drying time for the Sawdust Briquettesproduced. The quality of the produced briquettes' was found to be better and lower smoke generation when burn due to the lower binder content.

KEYWORDS-Biomass, Briquette, Rural Development, Starch, Binder.

INTRODUCTION

Coal is a combustible, sedimentary, organic rock, which is composed mainly of carbon, hydrogen, oxygen, nitrogen and sulfur.It is primarily used as a solid fuel to produce electricity and heat for the combustion. It has been estimated that there are over 847 billion tons of coal reserve worldwide which shows that there is enough coal to last us around 119 years at current rates of production. Incontrast, other common fuels like oil and gas reserves are equivalent to around 46 and 63 years at current production levels. Coal reserves are available in almost every country worldwide, with recoverable reserve in around in 70 countries. Sawdust briquetting machine uses the saw dust as the raw material. They are available in abundant at Rs3/kg.These are the left over remaining for the wood pulp. The advantages of the sawdust as briquettes is that it produces less smoke and higher Calorific value. It is also environment friendly and is very economical. These are also very useful in rural development and can also be used as a source of employment in rural areas. The cost of machine produced industrially is very high as compared to the prototype model. Starch which is used as binder is very useful as it helps I reducing smoke. The maintenance cost of the machine is very low, thesedo not get corroded easily and cleaning is very simple.

METHODOLOGY

It has become more and more important for companies to find low-cost methods of recycling their waste materials. This is especially true if these waste materials have high energy content and we want to take them back into the energy cycle.

Wood is a natural product which - highly compacted as a briquette - almost takes on the burning behavior of coal. Owning to their great density wood briquettes has a higher calorific value than the same quantity of firewood. They can be used instead of coal or wood in domestic solid-fuel stoves as well as in industrial furnaces.

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- Our Briquetting Press reduces the volume of your waste to save on storage and haulage costs. Your wood remains a natural product because it is briquetting without binder. Burning briquettes as fuel closes a natural conservation cycle - on combustion they only release as much carbon dioxide back into the atmosphere as was originally absorbed by the growing tree during photosynthesis.Our Briquetting Machines are exceptionally strong and low maintenance. The presses are simple and compact and can be mounted almost anywhere. The machines are designed to run 24 hours a day and, if the material to be briquetted is fed automatically into the hopper, then no operating personnel are required. The regular shape and consistent hard quality of the briquettes makes them simple to collect and stack.They have the reliability and longevity associated with electric machines. They produce high quality evenly shaped briquettes in a unique closed end die system. The advantage of this is that minimum friction is generated so the machine has very low wear rates. The required equipment's according to the survey were
- Die
- Extruder
- Hopper
- Motor

  The basic working consist of motor having a capacity 1Hp motor with 1400 rpm.Initially the saw dust is mixed properly with the binding agent starch and then it is allowed to pass through a hopper. The internal assembly consist of a rotating extruder and a fixed die at its outlet. A proper pulley is selected so as to match the required speed of the motor by adjusting pulley ratio. Desired briquettes are obtained through the die passage.

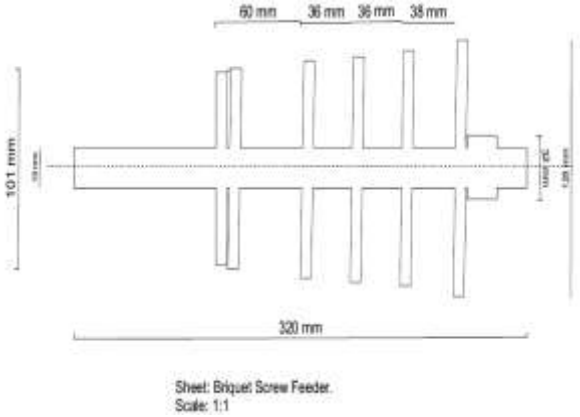

Fig:-Briquetting Extruder Design

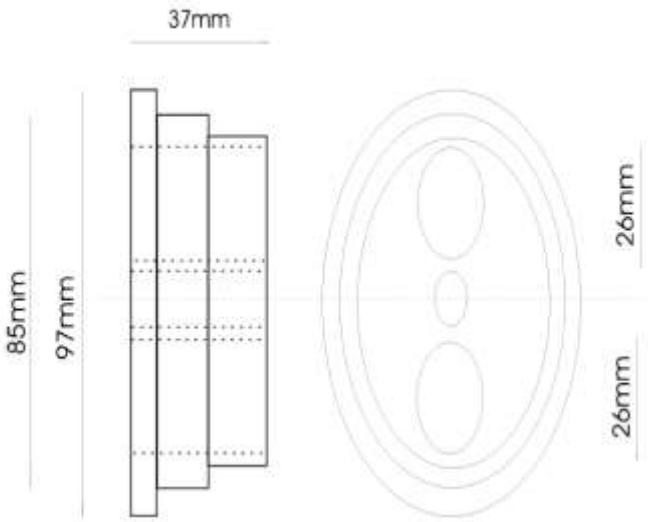

Fig:-Briquetting Die Design

CALCULATIONS

Assumed Pressure=85KN/m^2

The Required Pressure is calculated as;

$P_r = F/A$

Where, F=Force

A=Area

Since, Diameter (d) = 1inch = 0.0254m

$A = \pi r^2$

$= (3.142 \times (0.0254)^{2)} / 4$

$= 5.067 \times 10^{-4}\ m^2$

Therefore, $F = P \times A$

$= 85 \times 10^3 \times 5.067 \times 10^{-4}$

= 43.069 N

Torque is given by formula,

Torque= Radius x Force SinΘ

Here, r = 1feet = 0.3048 m

$\sin\theta = \sin(90) = 1$

Therefore, Torque = 0.3048 x 43.069

= 13.127 Nm

Power of the motor to be used is 750W, so rpm i.e. Speed of the motor is calculated by,

$P_w = (2 \times 3.14 \times \text{Torque}) / 60$

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Therefore, n = (P_w x 60)/ (2 x 3.14 x Torque)

= (750 x 60)/ (2 x 3.142 x 13.127)

= 545.52 RPM

Hence we choose the motor of standard 1400 RPM.

Since, Motor Pulley = 9 cm

Extruder = 24 cm

Therefore the pulley ratio of motor and extruder is given as,

Ration = 24/9 = 2.44

Therefore using the standard motor we get speed up to,

Speed = 1400/2.44

= 650 RPM

Hence the required speed of 545.52 RPM is satisfied using this motor.

RESULT

The machine general performance was found to be very good when working at the right slurry composition. The slurry moisture content was reduced gradually to find the minimum possible moisture content for continuous operation of the briquetting machine. The lowest value was found to be 30% moisture content, above which the machine started to stop frequently due to the die blockage by the relatively dry slurry.

Samples were taken for different slurry moisture content values, and the mass of each patch produced within a certain interval of time was measured on dry bases, measurements were usually taken after two days of sun drying of the specimens on open drying trays. The best production rate was found is 198 kg/h when the initial feed stock moisture content was adjusted to 35 %, lower moisture contents resulted in lower production rates due to the machine's frequent blockages, while higher moisture contents resulted in lower production rate after drying due to the initial higher water content.

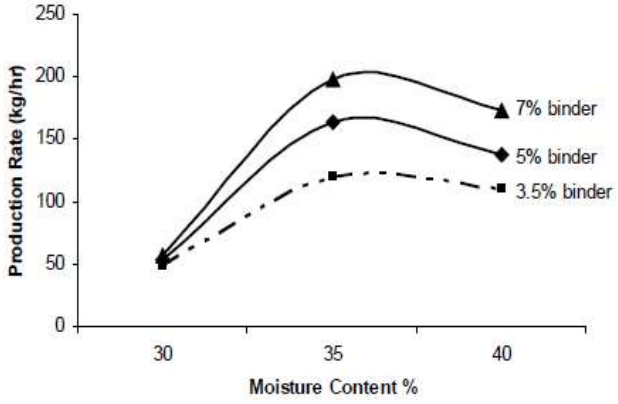

Fig:-Variation of the production rate with the change ofmoisture content.

CONCLUSION

The preliminary design and fabrication of the Sawdust Briquetting Machine which can produce 20 briquettes at a time using locally available material. Different agro waste can be used to produce briquettes using this machine. It is hope that is manually operated briquetting machine will be helpful to small and medium scale briquettes manufacturers

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