

Introduction to Bio Brick Machine

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ABSTRACT

Briquettes serve as an effective alternative energy source, primarily produced from agricultural and industrial waste such as rice husk, bagasse, groundnut shells, cotton stalks, and soybean husks. These biomass briquettes emit significantly less carbon compared to conventional fossil fuels. Many industries are transitioning from coal to briquette-based fuel to promote sustainable energy practices and reduce pollution. This project focuses on developing a cost-effective bio-brick machine capable of producing briquettes from agricultural waste with high efficiency and minimal human effort. The design integrates mechanical principles to optimize compression, durability, and productivity while supporting environmental conservation.

Keywords- Biomass Briquettes, Agricultural Waste, Renewable Energy, Bio Brick Machine, Sustainability.

I. INTRODUCTION

Briquettes are widely used as an alternative energy source due to their renewable and eco-friendly nature. They are made from waste materials such as rice husk, bagasse, groundnut shells, cotton stalks, and soybean husks, which emit lower carbon than fossil fuels. Across India and several other countries, industries have adopted briquette machines to replace traditional fuels, reducing both costs and environmental pollution.

Briquetting involves compressing raw materials into solid blocks that burn for longer durations and are easy to handle and transport. Briquettes are less expensive than coal, produce no fly ash, and demonstrate higher combustion efficiency. As a renewable energy source, briquetting improves environmental conditions and provides a sustainable fuel option for developing nations such as India, Indonesia, and Brazil

1.1 Existing Methods

1.1.1 Manual System



Fig.1.1: Manual brick making

Manual brick production is primarily used in small-scale operations. It does not require costly machinery and is feasible when abundant labor is available. Workers manually mold and dry the bricks before firing them in kilns to enhance hardness, strength, and density.

Limitations:

1. Prolonged manual labor may cause physical strain.
2. Insufficient labor availability can delay production.
3. Manual production is time-consuming and requires effort.

1.1.2 Automatic System

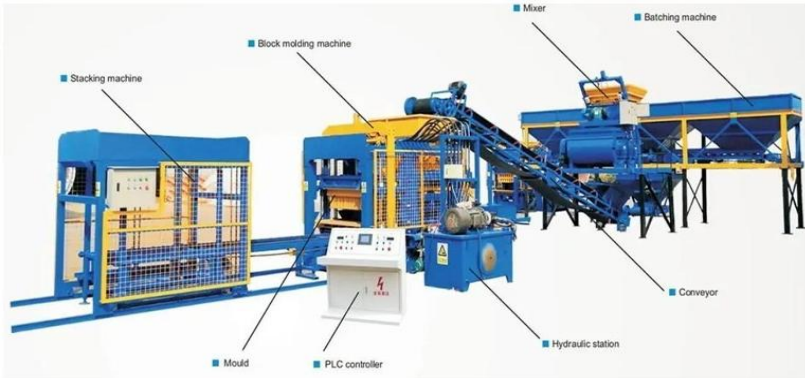


Fig.1.2: Automatic brick making machine

Automatic brick-making machines are used for high-volume production in shorter durations. These machines yield stronger, more uniform bricks with smooth finishes through vibration and compression. The typical molding cycle lasts 15–40 seconds, significantly improving productivity and consistency.

II. METHODOLOGY

3.1 Material

3.1.1 Material Collection for Machine



Fig.3.1: MS Plate

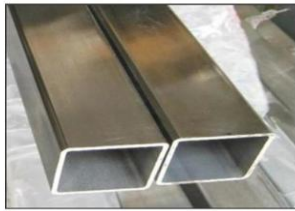


Fig.3.2: Square pipe 25*25mm



Fig.3.3: Circular Pipe

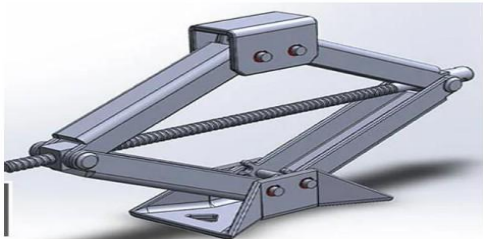


Fig.3.4: Patti Jack

Main frame and components are made from mild steel due to its strength, weldability, and cost efficiency.

3.1.2 Material Collection for Bricks



Fig.3.5: Collected Raw material(bagasse and sugar cane waste)

Raw materials: bagasse, babool wood dust, and sugarcane waste, chosen for availability and calorific value.

3.2 Manufacturing of Parts

Process sheet No.1

Name of the part – Main frame

Quantity – 1

Material- M.S.

Table 3.1: Main Frame

Sr. No.	Operations	Machine	Time(min)
1.	Cutting of metal plate	Metal Cutter	20
2.	Cutting of pipes	Metal Cutter	30
3.	Welding the pipes and metal plate	Arc welding machine	30
4.	Drilling the hole on pipes	Radial drilling machine	20

Process Sheet No. 2

Name of the part - Tray

Quantity – 1

Material - M.S.

Table 3.2: Tray

Sr. No.	Operations	Machine	Time(min)
1.	Cutting of metal Sheets	Sheet metal cutting machine	15
2.	Bending of sheets	Bending	20
3.	Drilling	Radial drilling machine	10

Process Sheet No. 3

Name of the part – Pressing

Bar Quantity – 4

Material - M.S.

Table 3.3: Pressing bar

Sr. No.	Operations	Machine	Time(min)
1.	Cutting of Pipes	Metal Cutter	20
2.	Welding	Arc welding machine	20
3.	Drilling	Radial drilling machine	10

Process Sheet No 4

Name of the part - Rod lock

Quantity – 1

Material - M.S.

Table 3.4: Rod lock

Sr. No.	Operations	Machine	Time(min)
1.	Bending of rod	Bending	15
2.	Welding	Arc welding machine	10
3.	Drilling	Radial drilling machine	15

Process Sheet No 5

Name of the part-Dies (Circular & Square Dies)

Quantity-1

Material-M.S.

Table 3.5: Dies

Sr. No.	Operations	Machine	Time(min)
1.	Cutting of metal Sheets	Sheet metal cutting machine	20
2.	Bending of sheets	Bending	20
3.	Drilling	Radial drilling machine	15
4.	Welding	Arc welding machine	15

3.5 Design Procedure

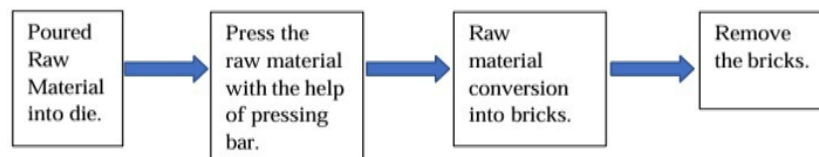


Fig.3.11: Layout Configuration

Table 3.6: Compressive Strength of briquettes

Sr. No	Briquette Type	Load (KN)	Compressive Strength (N/mm ²)
01	Bagasse	10.20	4.08
02	Babool Wood	15.40	6.60
03	Sugarcane Waste	6.30	2.52
04	Soyabean husk	8.30	3.32
05	Cotton Stalk	8.70	3.48

3.7 Calorific values of bricks:

Determination of calorific values by using bomb calorimeter

Table 3.7: Calorific values of bricks

Sr. No.	Brick No.	Bricks material			Calorific Value (J)
		Babool wood (%)	Bagasse (%)	Other agricultural waste (%)	
01	1	100	0	0	4707
02	2	50	50	0	4702
03	3	0	100	0	4700
04	4	80	15	5	3880
05	5	70	15	15	3500
06	6	60	20	20	3440
07	7	50	30	20	3200
08	8	40	30	30	3080

Detailed machine design, drawings, and compressive strength calculations included. Use equations and tables as shown earlier (Tables 3.6 and 3.7)

III. RESULTS

Experimental results confirm the feasibility of the designed bio-brick machine. Tables 4.1 and 4.2 summarize applications, advantages, and cost estimates.

Table 4.1: Application

Boilers	Sugar mills, paper mills, food processing units, etc. using fuel for steam generation and heating.
Foundries	For metal heating and melting.
Brick kilns	For firing of furnaces.
Residential heating	Hotels, canteens, for winter heating in cold areas.

IV. CONCLUSION AND FUTURE SCOPE

The bio-brick machine successfully converts agricultural waste into energy-efficient briquettes at a low production cost (~₹3450). Future Scope: Integration of automation, multiple dies, and sensor systems for process optimization and scalability.

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