

Design, Development and performance Assessment of manually operated Hydraulic Compression Machine to Produce Briquettes Appropriate for Rural Communities

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Mechanical Engineering

By

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SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

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Accredited with grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of KANIGIRI KISHORE (37150086) and GUNDE DANIEL (37150066) who carried out the project entitled **“DESIGN, DEVELOPMENT AND PERFORMANCE ASSESSMENT OF MANUALLY OPERATED HYDRAULIC COMPRESSION MACHINE TO PRODUCE BRIQUETTES APPROPRIATE FOR RURAL COMMUNITIES”** under my supervision from November 2020 to March 2021.

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DECLARATION

KANIGIRI KISHORE (37150086) and GUNDE DANEIL (37150066) hereby declare that the Project Report entitled “**DESIGN, DEVELOPMENT AND PERFORMANCE OF ASSESSMENT OF MANUALLY OPERATED HYDRUALIC COMPRESSION MACHINE TO PRODUCE BRIQUETTES APPROPRIATE FOR RURAL COMMUNITIES**” done by me under the guidance of **Dr. M. ANISH, M.E., Ph.D.**, is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Mechanical Engineering.

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Place : 2.

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Abstract

Briquetting is a mechanical process for compacting bulky materials to improve their density. An upgraded low-cost briquetting system has been developed and constructed successfully for community use during this current research. Concepts have been developed which directed the creation of a preliminary design that complies with practical requirements. Mechanical (hydraulic or piston) compression technique was used to build the briquetting unit. The unit is handled manually by a hydraulic mechanism to generate the required compression pressure. The briquetting press consists of the structural mild steel frame, the pressing assembly, the mould mounting and the hydraulic jack. A basic four-mould hydraulic piston press biomass briquette producing system has been built in this study, suitable for rural communities. Saw dust powder is being used in varying particle sizes of less than 6 mm, and the starch binder has been used in this feasibility study as a binding agent. In the four-mould square assembly the saw dust combined with the starch binder was poured. The pressure is exerted with 3 tons of hydraulic Jack demystifying the biomass in the moulds; the briquettes were extracted from the lower part of the mould box by removing the bottom plate. Upon densification the perforation slots were made on the mould and base plate to remove the excess water from biomass. Based on an individual, each batch usually involves filling the biomass, closing the device lid and lifting the jack takes about 3 and 6 minutes. Depending on the rate at which the briquetting system is made, the prototype built has an output capacity of 10 kg / h — 12 kg / h. The findings derived from the assessment showed that the force applied on the plunger (F1) was 490.5 N, the cumulative force of the compaction was 355.03 N, the cumulative compaction pressure was 3 MPa, the maximum bending stress was 456 MPa and the estimated area was 0.015 m².

A biomass study of the generated biomass briquette reveals that the performance of the unit is satisfactory. The briquettes have also been calculated for their energy characteristics. After briquette formation, the calorific value was determined around 5950 KJ / Kg.

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LIST OF SYMBOLS AND ABBEREVIATIONS

CDM	Considered a clean Development
GHS	Green House Gas
IREDA	Indian Renewable Energy Development
AGE	Asian Regional Research Program In Energy
MSW	Municipal Solid Wastes

CHAPTER 1

INTRODUCTION

1.1 Background of The Study

As of late, on account of its natural advantages, the utilization of biomass as a worldwide fuel source has pulled in much consideration. Progressively, it is proposed that biomass be utilized in the creation of energy (biofuels) to supplant petroleum derivatives. Biomass can likewise give a particular answer for diminish the measure of carbon dioxide in the environment. It has three other primary benefits: first, its utilization is practically boundless; second, limitation; second, it very well may be utilized without hurting the climate. Contrasted and other fuel sources, it not just decidedly affects the world, yet, as atomic force and oil energy, there is no danger of genuine mishaps. Because of their variety, biomass materials are normally low in amount, so it is hard to appropriately handle a large number of the materials utilized. Therefore, huge expenses are brought about during the organization of products (transportation, stockpiling, and so on) Rural waste is for the most part not as alluring as a home

Because of its low force and high related limit. Briquetting or biomass blockage shows a gathering of advances used to change over biomass into fuel. Its motivation is to join light rural and ecological waste into high-energy particles of different shapes and sizes. These light sources incorporate wood chips, husks of rice, biogas, sawdust, paper and other fatty and low-calorie, "ice blocks". The briquetting cycle builds the calorific estimation of the net per unit volume, is not difficult to ship and keep up, is not difficult to deal with buildups, and the fuel delivered is equivalent in size and quality. This interaction works on biomass preparing, diminishes travel costs, and tackles stockpiling issues. With an end goal to improve agglomerate designs, it could be important to kill biomass combustible substances (like water).

The gear used to pack biomass can be isolated into three classifications as indicated by its pressing factor. The principal stage is high-pressure gear with a pressing factor of in excess of 100 MPa. This sort is reasonable for buildups with a high lignin content. Under this high tension, the temperature ascends to around 200-250 ° C,

It is adequate to join the lignin substance of the buildup to be utilized as a bond, so no extra restricting materials are required. The second is a medium pressing factor machine with a pressing factor of 5 MPa to 100 MPa, which decreases heat creation. Much of the time, this

kind of machine requires the utilization of an extra warmth source to disintegrate the interior lignin substance of the crude material, consequently disposing of the requirement for extra folios. The third class is low-pressure machines that work at pressures under 5 MPa and at room temperature. This third kind of machine requires the expansion of restricting materials, and because of the absence of lignin material in the carbon cycle, it is viewed as the most appropriate sort of carbonated material. The yield of these machines is between 25-1800 kg/h, contingent upon the distance across of the pressure station, the kind of pressure material and its presentation. The motivation behind this undertaking is to plan a briquetting machine, assemble and test a briquetting machine. Hence, crafted by the undertaking incorporates the plan, creation and testing of the exhibition of the briquette machine.

Force is fundamental in all areas of the economy, and the connection among force and public advancement can't be overemphasized. This is on the grounds that force is the establishment of monetary and social turn of events. Existing fuel sources, particularly petroleum products, may not be sufficient to satisfy the developing energy need since they will be depleted and one day they will be depleted. Notwithstanding, this is a worldwide energy emergency, which is brought about by populace development, modern development and mechanical advancement. This provokes an interest for energy under extra tension. As per the investigation of Kagyupa and Turkey (2002), 86% of the energy utilized comes from petroleum products, and its utilization is straightforward and effective. Nonetheless, albeit petroleum products are energy proficient, they likewise have a few disadvantages and downsides that make them less appealing. The most remarkable of these inadequacies are natural contamination, falling costs, significant expenses, supply disturbances and, above all, non-sustainable.

Along these lines, particularly on a sustainable premise, elective fuel sources are required. Plant-created biomass can be utilized as another sustainable crude material and impartial carbon in energy creation. Wood, farming fiber and grass fat are the main wellsprings of biomass energy.

The normal estimation of yield creation and farming buildups delivered by business crop pivot plants is low, and has generally made garbage removal issues. Indeed, these fossils address a huge, economical and effectively accessible wellspring of sustainable lignocelluloses biomass. Contrasted and petroleum products, it can fundamentally diminish fossil fuel byproducts. Thusly, inexhaustible and manageable energizes are viewed as spotless turn of events (CDM) to diminish gas discharges (GHG). On the off chance that biomass is appropriately controlled, it will bring numerous advantages, the most significant of which is inexhaustible and supportable force supply. Notwithstanding, one of the primary constraints of biomass utilized for energy reasons for existing is its little amount, typically between 80-100 kg/m³ of grass and grass particles and 150-200 kg/m³ of strong biomass, (for example, wood chips) [9]. . The low thickness of biomass typically makes it hard to store, move and use items. The little amount

additionally carries difficulties to innovations, for example, coal consuming, in light of the fact that huge changes in amount will make it hard to supply fuel to the evaporator and lessen eco-friendliness. Briquetting is a promising method to beat these impediments.

Furthermore, in country regions, the most well-known and least expensive fuel source is biomass, which is the principal fuel source. As a sustainable power source with an extraordinary construction, biomass is made out of sugars. Some environmentally friendly power sources, for example, wind energy can't beat biomass energy, since biomass is broadly viewed as an overall fuel that can deliver oil, biogas, and power.

To build up India's regular assets, the Indian Renewable Energy Development Agency (IREDA)- a monetary foundation has financed many dinner projects, all of which use cylinder machines for diversion. In spite of certain disappointments, India is the lone country where the dating business is gradually developing. Because of the accomplishment of IREDA and restricted promoting endeavors, numerous business people are sure of putting resources into biomass mass. These business visionaries likewise put forth meticulous attempts to improve the creation interaction and innovation.

1.2 Problem Statement

As we as a whole know, oil, coal and petroleum gas are the world's significant fuel sources. We perceive that an increment in the impact of warmth catching will influence an Earth-wide temperature boost. Despite the fact that there are significant wellsprings of energy, they produce contamination and effect sly affect the earth, like expanded a worldwide temperature alteration, corrosive downpour, and metropolitan smoke and residue. This issue makes the world attempt to diminish fossil fuel byproducts. 80% decrease

In certain spaces, they consume open biomass straightforwardly. They didn't reuse biomass appropriately. After the rice reap, ranchers consumed a huge number of huge loads of grass and discarded it. Consuming grass contaminates the climate, yet additionally makes street mishaps if the arenas are near the parkway. During the stormy season, the grass in the field will enter the water framework and become obstructed after removal, which will permit the microscopic organisms to duplicate.

The most exceedingly terrible of the horticultural remainders as they save their low energy amount, making the board troublesome, exorbitant to move and store, and lead to helpless fire execution. Nonetheless, these issues can be overwhelmed by pushing on packed fuel with briquettes. In this manner, by changing over open biomass into more fuel, waste can be provided in a satisfactory and moderate manner, hence recovering waste into environmentally friendly power.

Along these lines, the advancement of a biomass briquette machine will defeat this issue and become more regrettable. The subsequent item is called briquettes and has numerous benefits. They don't transmit fly debris, sulfur or phosphorus-containing smoke. Consequently, there is no threat to the climate.

1.3 Project Aim & Objectives

The reason for this investigation is to build up an embellishment machine for pressure driven cylinder type biomass briquette. The reason for the examination is to:

- Design a cylinder drill for biomass briquetting.
- Design and plan of cylinder press biomass briquette machine for development
- Use sawdust and starch cover to check machine execution.

1.4 Justification of The Study

An agglomerate is a flammable material made by squeezing or packing an item into a strong structure. It tends to be utilized as fuel for ovens, coal and bubbling. Compelling waste into agglomerates can give enduring answers for the issues of waste administration and removal on homesteads and urban communities. Consistently, huge amounts of agrarian waste are gathered from ranches, homes, markets and handling plants to landfills. This adds to the synthetic responses that happen in the landfill, prompting the development of methane, which dirties the air and groundwater. A few houses dump squander in the terrace, and afterward consume it inappropriately, making air contamination. In numerous terrains, human garbage removal frameworks during the blustery season are a significant reason for floods in certain spaces. A great many people have never understood

that this farming waste is an incredible wellspring of energy that can give petroleum derivatives to animals and plants.

1.5 Scope of The Study

To accomplish the objective, the venture work has the accompanying measurements:

- Design and assemble a biomass briquetting model machine.
- Convert certain horticultural waste (sawdust) and starch bonds with an end goal to decide the capacity of the inherent and fabricated machine.
- Change the physical and warm properties of briquettes.

1.6 Advantages of The Briquetting Technology

Briquette is a decent spot to consume wood straightforwardly. Their proceeded with use should turn into an indispensable piece of public and global ranger service and environments. Briquetting innovation is utilized to coordinate biomass/farming buildups into very good quality briquettes. Dispenses with the executives, stockpiling and transportation issues. There is basically no fire and practically no smoke when it consumes. It shouldn't be cut. It is spotless and can be cooked gradually. It tends to be cooked to similar temperature and endures longer. It is smokeless, dull and cordless. It has less breaking and better strength. It will help the formation of work open doors in rustic spaces of non-industrial nations. These innovations are both harmless to the ecosystem and harmless to the ecosystem. By implication, this is an approach to utilize the maximum capacity of the ranch to produce power/heat through the briquetting innovation course. In this way, biomass reconciliation after carbonization might be a promising methodology.

Bhattachaya et al. (2005) proposed an appraisal of the expected assets of biomass assets in five Asian nations China, India, the Philippines, Sri Lanka and Thailand. It depends on point-by-point public level exploration directed in these nations under the Regional Research Program on Energy, Environment and Climate (ARRPEEC) in these nations in Asia. Studies have been directed at the public level to gauge the likely potential: improvement and substitution of petroleum derivatives. In China, India, the Philippines, Sri Lanka and Thailand, the steady limit of uninvited biomass assets in 2010 is assessed to be 8.90, 8.77, 0.97, 0.14 and 0.82 EJ, separately. In certain nations, limit is assessed to represent 17%, 45%, 34%, 33%, and 14% of assessed power utilization in 2010, separately

CHAPTER 2

LITERATURE REVIEW

2.1 History of Briquetting Machine

In 1919, Henry Ford consistently needed to bring in cash quick. He tracked down that the greater part of his cash was spent on wood used to make "A" vehicles. As he continued looking for a superior method to utilize the wood, he concocted the possibility of making briquette charcoal for all waste. The way toward making them is basic and modest, and he can offer them to process plants and other people who need modest fuel. Individuals before long started to utilize them for warming and cooking, so a cutting edge coal flame broil was created. It is quite difficult, however Ford has without a doubt made cooking out-of-the-case charcoal simpler and more famous. Passage moved the business to a relative named Kingsford, and some of it has become history.

Portage posted his brand name on a charcoal fire engine and sold it just at various vehicle sales centers. At the point when Ford kicked the bucket in 1947, the coal business was nullified. Henry Ford II assumed control over the synthetic business and offered it to nearby financial specialists, who changed their name to their neighborhood legacy: Kingsford Chemical Company. At that point, Kingsford was a man, yet additionally a city. Because of the monetary achievement of Ford's lumber, segment and coal plants, the land used to assemble the principal wood business was named as a remembrance to early business people.

2.1.1. The Invention of Charcoal Briquettes

Nonetheless, Ford didn't create coal. He didn't concoct charcoal briquette. Truth be told, the designer of the charcoal making technique was Ellsworth B. A. Zwoyer of the United States. He applied for a patent in 1897, however his business fizzled. Portage accepted the thought (maybe without the utilization of a pen) and went into business. Coal delivered in this manner is produced using sawdust that is left over from the sawmill. At that point blend it in with a folio and structure. Put it in a pleasant little key and warmth it in an undesirable stove. Most cements will consume during the warmth, yet perfectionists will reveal to you that a few glues are sturdy and can add flavor to anything you cook. Some coal is presently sold as a programmed fuel item. This implies they can add sodas. This can likewise improve the flavor of food. To dispose of these added substances, you need to go through more cash and get hot squares, frequently called irregularities. These are generally made of costly hard wood, cut into little pieces, and afterward heated into charcoal.

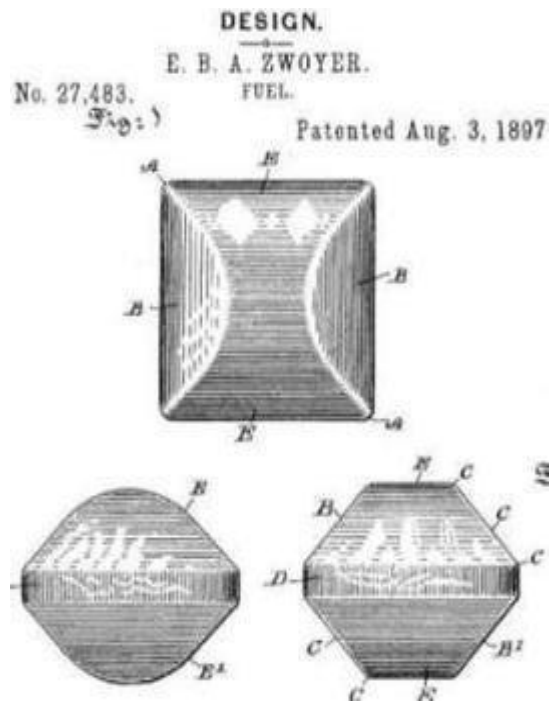


Fig. 2.1: First patented pillow shaped briquette

Coal has been delivered worldwide for millennia. A typical method is to place enormous bits of wood in a huge cone. Residue the wood with dust, leaving a chimney stack opening at the top and other air openings at the base. Light the wood on the floor and let it consume for a couple of days. This is a long and moderate interaction, yet to deliver coal rather than cinders, the wood should be scorched gradually and cautiously. You can figure this is a fine art. After the wood has been scorched to a decent condition of charcoal, close every one of the openings and permit it to cool. In the event that you do it right, you ought to reuse 20% of coal as coal.

Portage posted his brand name on a charcoal fire engine and sold it just at various vehicle sales centers. At the point when Ford kicked the bucket in 1947, the coal business was nullified. Henry Ford II assumed control over the synthetic business and offered it to nearby financial specialists, who changed their name to their neighborhood legacy: Kingsford Chemical Company. At that point, Kingsford was a man, yet additionally a city. Because of the monetary achievement of Ford's lumber, segment and coal plants, the land used to assemble the principal wood business was named as a remembrance to early business people.

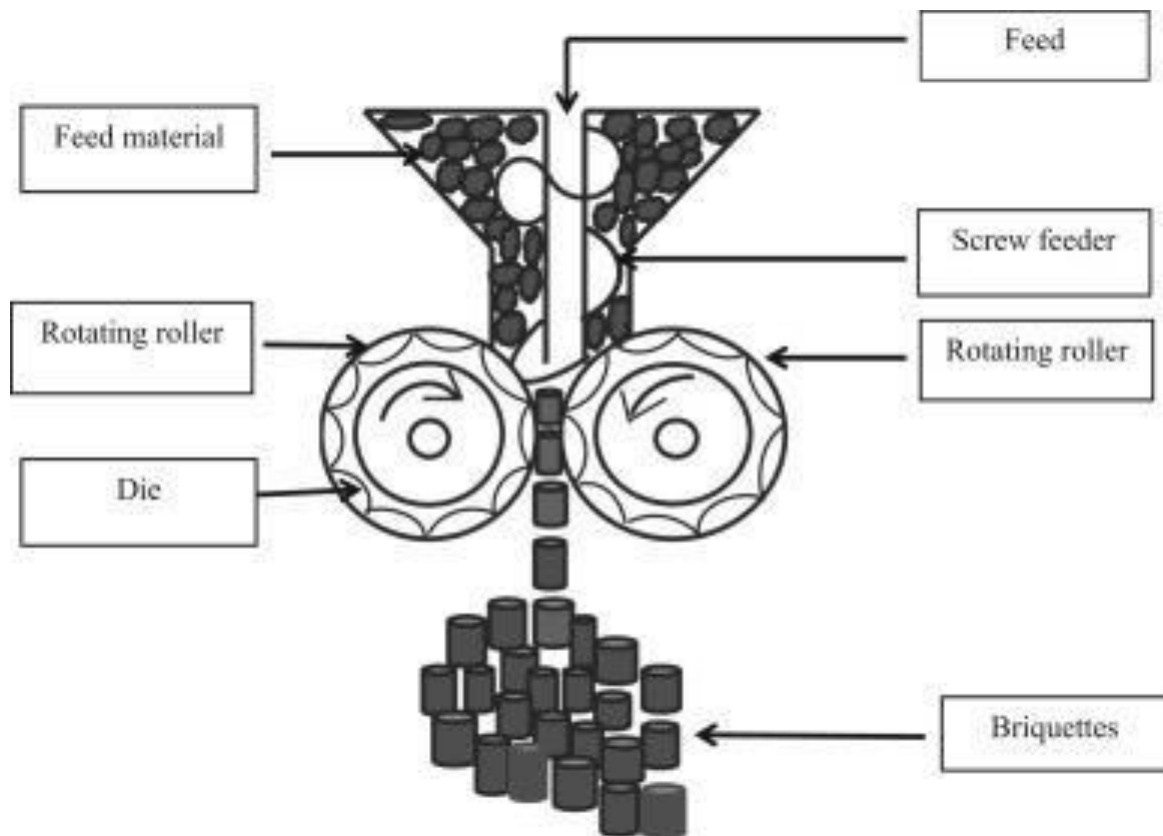


Fig 2.2: Roll press briquetting

2.1.2 Briquetting In World War I & II

During the First World War and the 1930s, the utilization of different types of natural briquettes appeared to be normal. In light of the advancement of Germany during the 1930s, Switzerland made present day cylinder briquetting machines. During the First World War, affected by fuel deficiencies, fuel wood and other byproducts turned out to be regular in numerous European and American nations. Comparative prerequisites constrained the Japanese to improve the bundling machine portrayed underneath. After the conflict, briquettes sold enormous amounts of modest hydrocarbon oil.

During the 1970s and mid 1980s, particularly in Scandinavia, the United States and Canada, energy costs stayed high, particularly in industry, where the utilization of natural stone pots continued. In Japan, as of not long ago, with the far and wide utilization of "Goalie" briquettes made of umbilical wood, kissing appeared to be normal. Japanese innovation has been stretched out to Taiwan and afterward to different nations like Thailand.

In Japan, and afterward in Taiwan, wedding assortments were on the whole dependent on the utilization of print machines. Albeit the print machines started in the United States, Asians acknowledged print machines more broadly than European or American makers. These briquettes were generally utilized in Japan during the 1950s rather than charcoal, which was broadly utilized at that point.

2.2 TYPES OF CHARCOAL

There are different types of charcoal available in the market. They are described briefly in the following topics.

2.1.2 Common Charcoal

It is made from peat, coal, wood, coconut shell or petroleum



Fig.2.3 Coconut shell briquettes

2.2.2 Sugar Charcoal

It is found in sugar removes and is especially perfect. It tends to be refined by overflowing with corrosive to eliminate any minerals, and afterward consuming in chlorine for quite a while to eliminate the last hints of hydrogen. Henri Moissan (Henri Moissan) utilized it when he originally attempted to make engineered jewels.

2.2.3 Activated Charcoal

It is like conventional coal, however is for the most part utilized for clinical purposes. To deliver initiated carbon, common coal is warmed to about 900°C (1,650°F) within the sight of gas (generally steam), so the coal makes more inner spaces or "pores", which helps enacted coal Capture synthetic substances. . In this cycle, the contamination on the coal surface has additionally been eliminated, extraordinarily improving its publicizing capacities.



Fig.2.4: Char activated Briquettes

2.2.4 Lump Charcoal

It is a traditional charcoal made directly from hardwood material. It usually produces far less ash than briquettes



Fig 2.5: Sugar and Lump charcoal briquettes

2.2.5 Japanese Charcoal

It had pyrolytic acid removed during the charcoal making; it therefore produces almost no smell (or) smoke when burned. The traditional charcoal of Japan is classified into two types:

- White charcoal (Bukhan) is very hard and produces a metallic sound when struck.
- Black charcoal [ja]
- Oaten is a more recent type made from hardened sawdust.



Fig 2.6: Oaten, Japanese hardened sawdust briquettes



Fig 2.7: Japanese, "Rennet" briquettes with fire start



Fig 2.8: Japanese high grade “Binchotan” charcoal briquettes



Fig 2.9: “Mamet an”, Japanese pillow shaped coal briquettes

2.2.6 Pillow Shaped Briquettes

They are made by squeezing coal, which is typically made of sawdust and other wood-based materials, added substances and different added substances. The bond is generally starch. Briquettes can incorporate lignite (heat source), mineral carbon (heat source), borax, sodium nitrate (burning guide), limestone (dark brightening specialist), wood (ignition help) and different added substances.

2.2.7 Saw Briquette Charcoal

It is made by squeezing sawdust without folios or added substances. With discretionary coal in Taiwan, South Korea, Greece and the Middle East. It has a round opening that slices through the middle with six cross-segments. It is fundamentally utilized for broils, as it doesn't deliver exceptional scents, smoke, debris, high temperatures and fast warming (more than 4 hours).

2.2.8 Extruded Charcoal

It is finished by eliminating crude wood or carbon-based logs into wood without the utilization of cements. The warmth and pressing factor during the expulsion extraction measure keep the coal together. On the off chance that the removed part is made of log material, the extricated log will be made of carbon.

2.3 PRINCIPLE AND TECHNOLOGY OF DENSIFICATION

The possibility of briquettes is to utilize durable materials for adequate amount and to fill them with strong fuel that is in acceptable condition that can be scorched as wood or coal. Various kinds of waste can be utilized, for example, ground paper, plastic and other burnable materials.

Contingent upon the sort of material, pressure applied and the connection utilized, distinctive restricting techniques can be utilized. The limiting component of biomass under high tension can be isolated into attachment and holding, the holding between strong particles and holding bonds. Applying high strain to the biomass will make mechanical holding and increment the grip/holding (atomic powers, for example, the Van der Waals power) of strong particles, subsequently making intermolecular bonds in the contact territory. This is finished with a bloom press. As indicated by FAO (2010), briquettes can be separated into five significant sorts relying upon the kind of gear utilized. Cylinder press, screw press, roller press, pelletizer, hand devices and low pressing factor briquetting. Contingent upon the applied pressing factor, the

briquetting innovation can be separated into: high pressing factor pressure, medium pressing factor pressure helped by a warming gadget and low pressing factor cement).

2.3.1 Types of Densification

Previously, the blend of flammable materials used to make up for fuel was a strategy utilized by numerous social orders before, albeit the strategies utilized were straightforward securities, bundling, or drying.

2.3.1.1 High And Medium Pressure Densification

It doesn't utilize different cements, and energy utilization is additionally exceptionally low. For this situation, with a screw blower, the biomass will be persistently squeezed by a hot square with a screw. With cylinder press pressure, the hardness of the slide contact part is more modest than that of the pressing factor screws and slides. As far as quality, print machines have preferable account and creation measures over cylinder presses. The interaction of the rise of a press machine is identified with the focal point of the pore, which assists with accomplishing a total and level fire. Thusly, such briquettes can be carbonated.

2.3.1.2 Screw press

Screw expulsion gear is appropriate for little applications. Because of the particular space of the surface, the focal opening introduced in the briquettes delivered by the screw extruder assists with improving the imperviousness to fire. The agglomerates created are special, difficult to scatter, and show top caliber. Because of the great temperature, this may permit coal to enter numerous frameworks and boilers. The crude material of this coal scanner is 100 to 200 Kg/m³ of mass biomass, and the yield is 1200kg/m³. The high thickness causes the agglomerate to have a higher temperature esteem (kJ/kg), contrasted and the material utilized, the agglomerate consumes less.

The principal improvement of the print machine was finished in the United States during the 1930s, which prompted the far reaching utilization of the PRES-TO-LOG model dependent on the roundabout extruder at present found in the Belgian Biomat recipe. During the eleventh World War, a Japanese plan was being created with a single form and a shaft in the focal point of the vacuum cleaner mass. It was extremely effective, and one of the producers in our investigation professed to have sold 600 units. The plan has been embraced by different makers in Asia, and has as of late been received in Europe.

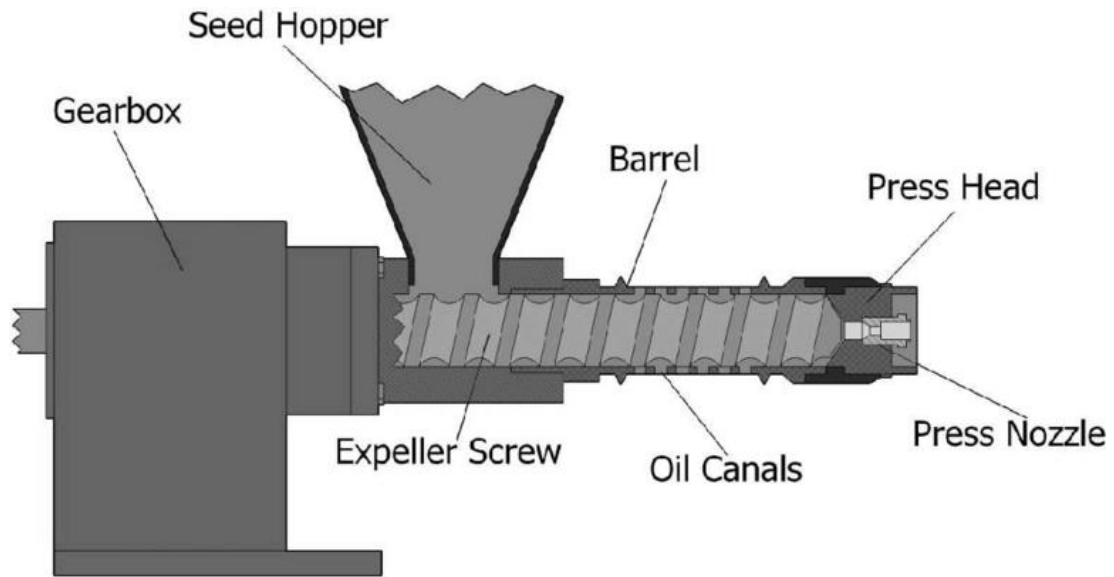


Fig.2.10: Screw press briquetting

In a screw press, the material is consistently embedded into the screw, in this way driving the material into the round and hollow form. This process is generally warmed, raising the temperature to where lignin stream happens. The pressing factor develops consistently around the screw, not ceaselessly affected by the cylinder.

On the off chance that the shape isn't warmed, the temperature may not ascent enough to create lignin stream, and a folio may should be added. This might be molasses, starch or other modest natural substances. The briquette carbonized material can likewise be embedded into the screw press. For this situation, since the lignin is harmed, a limiting specialist ought to be utilized. Albeit this is uncommon, some low-pressure cylinder machines may likewise require the utilization of glues.

At the point when the shape is warmed, the temperature generally ascends to 250-300°C. At the point when the underlying mugginess is lower than 15%, practically all natural materials will deliver great agglomerates. The agglomerates of the screw machine are by and large of better caliber than the agglomerates of the cylinder unit, and the agglomerates of the cylinder are heavier, and the break lines are probably not going to arrange in an orderly fashion.

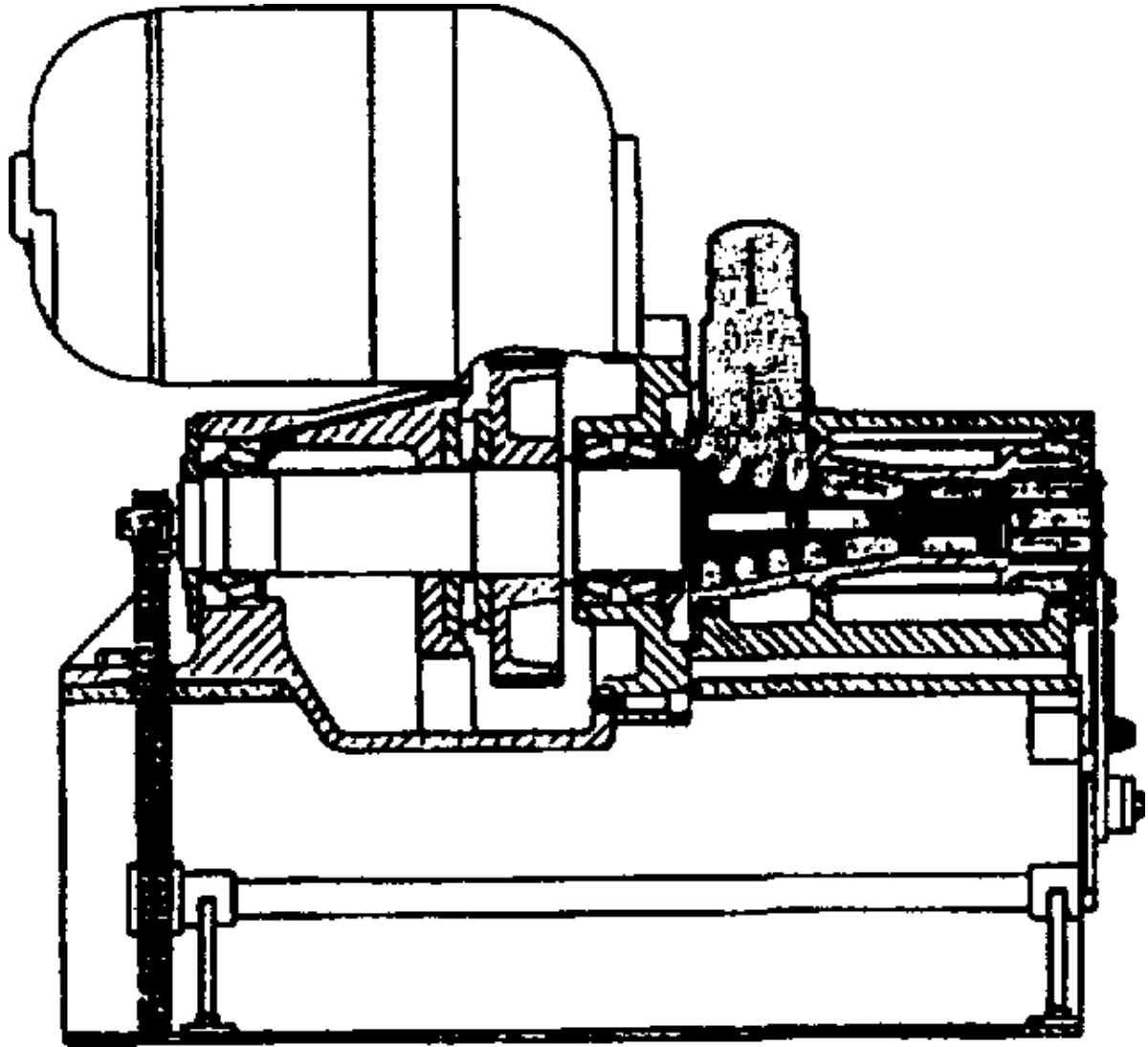


Fig 2.11: Press to Log Briquette

The significant expense of the screw hardware can be somewhat lower than that of the cylinder unit, despite the fact that it is hard to straightforwardly contrast due with the distinction in size. In any case, on the grounds that the screws that should be revamped regularly are seriously worn, their upkeep costs are generally high. What's more, they have higher force necessities than cylinder machines.

Here, the pressure speed, mechanical force utilization and the nature of the agglomerates delivered rely upon: the stockpile of streaming and blended materials, molecule size and appropriation, surface strength and grip. Fixing hardware is fundamentally partitioned into three kinds: round screw press, screw press with consuming mold and screw press without consuming fire. The benefits and detriments of this innovation are

- Continuous output and uniform sized briquettes.
- Partially carbonized outer surface of the briquette, facilitating easy ignition, combustion and protection from ambient moisture.
- Smooth run without any shock load.
- Light weight due to absence of reciprocating parts and flywheel.
- No contamination of machine parts and the oil used.
- The power requirement of the machine is high compared to that of piston press.
- Wear and tear is high.

2.3.1.3 Piston Press

This machine works in constant mode. For this situation, the material is embedded into the chamber and squeezed into the cylinder into a little form. At that point, when the pressing factor is applied to the machine by a responding pressure head provided by a huge liquid or an electrically worked cylinder, it is lighted by the crash. Creation of these machines is between 25-1800 kg/h, contingent upon the width of the pressure station, the sort of pressure material and its presentation. There are two sorts of cylinder presses: mechanical cylinder presses and water powered cylinder presses. Water driven presses apply strain to the longitudinal hub, yet in addition apply strain to the outspread side. Not at all like mechanical cylinder press, the energy from the cylinder is moved from the electric engine to the cylinder through an oil pressure blower framework. Contrasted with mechanical gadgets, its pressing factor chamber is more slow, so it has a reduced construction, less weight, and lower yield. This machine can endure high moistness content than the 15% stickiness content typically embraced by mechanical cylinder gear. The benefits and disservices of this innovation are:

- As there is a limited quantity of related development between the slam and the biomass, the smash's wear is significantly decreased.
- Very grateful innovation.
- The briquette is somewhat harmed on the grounds that the external layer is without carbon

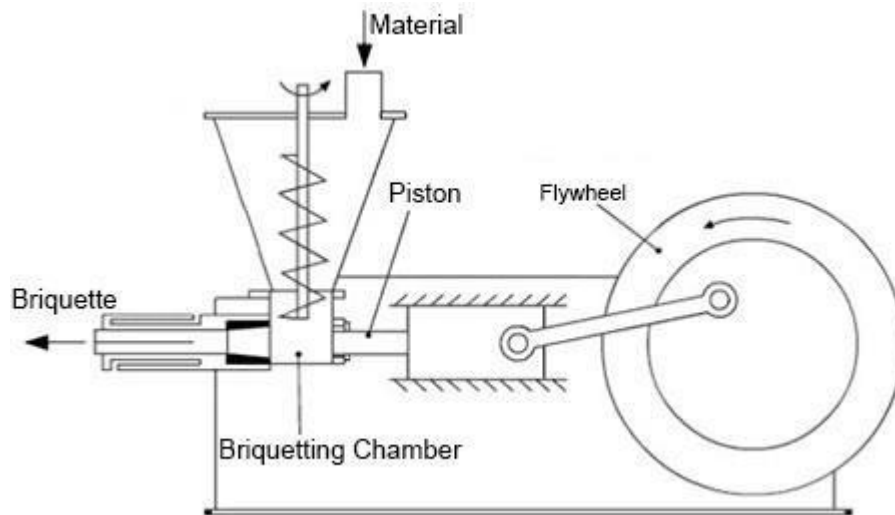


Fig 2.12: Piston press briquetting

Obviously, the advancement of present day cylinder presses started in Switzerland during World War II, in spite of the fact that it depended on the German control of the 1930's. Swiss improvement centers around Fred Hausmann and Glom era print machines. There is no uncertainty that Hausmann assumed a critical part in making the cylinder press innovation globally perceived. In numerous spots, the name Hausmann is regularly inseparable from a cylinder press.

Presently, there is no patent that controls the general plan of this sort of machine, and the majority of the cylinder press makers recognized in the investigation guarantee that their plan was the primary Swiss patent. As indicated by their record, the latest relative of the principal producer of cylinder machines is Power-SPM.

Cylinder machines can be worked precisely from a huge flywheel with a driving rod, or electric. The hardware is typically enormous, with sizes going from 0.45 to 0.3 t/h, while the size of water driven gear is generally 0.25 t/h, albeit a few models are bigger.

Mechanical fix hardware is typically made of numerous materials to make hefty and adaptable agglomerates, while water powered machines working at low pressing factors produce less forceful and here and there gentler and more vulnerable agglomerates.

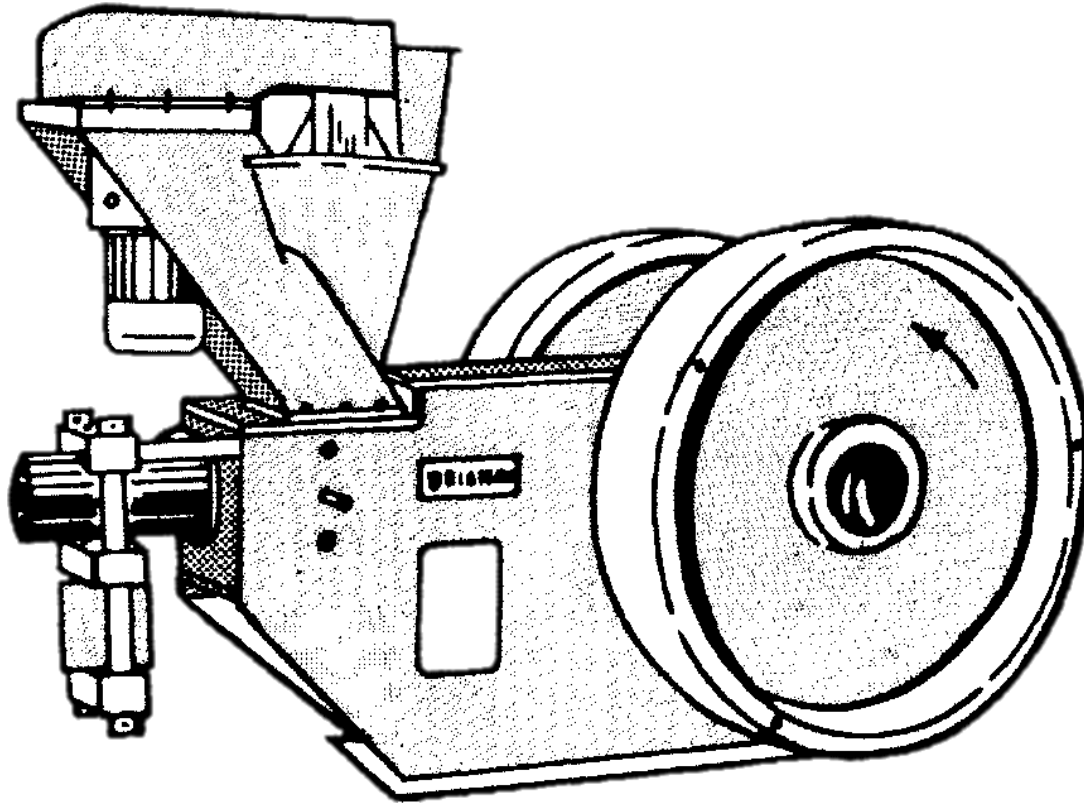


Fig 2.13: Flywheel mechanical piston press briquetting machine

2.3.1.2 Low Pressure Compaction

Bonds are needed in low compel blends to help assemble connections between biomass particles. Connections can be little film glues (tar, petrol tone and Portland concrete), framework connections (coal and sodium silicate) and substance glues (low water, sodium silicate and lignosulfonate)). On the other hand, these glues can be isolated into two classifications: natural glues and non-living cements, specifically:

- Organic binders: Molasses, Coal tar, Bitumen, Starch, Resin
- Inorganic binders: Clay, Cement, Lime, Sulphite liquor

Here subsequent curing (drying, burning, chemical reaction, etc.) is required after compaction to provide the “green” briquettes with required strength and stability.

2.4 Hand Mould Briquettes

A limited quantity of protuberances can likewise be made with hand shape. Because of the idea of the commitments to build up hydrogen connections among them and biomass, they should be dried in the sun or a little warmth treatment in a warm stove to make a solid weight. In China, squashed charcoal is blended in with water and about 20% of the dirt that is shaped, at that point made into honeycomb agglomerates by a briquetting machine, and afterward dried in the sun. In a high quality cylinder machine, finely ground biomass (sawdust, rice husk, shavings, coal dust, and so forth) is blended in with 20% (misuse) of the homestead to frame agglomerates.

Notwithstanding, plastic and civil waste can't be changed over into agglomerates similarly, as it doesn't contain a lot of natural matter, like lignin, which can be utilized as a characteristic security. Consequently, high pressing factor and pressing factor ought to be utilized.

A few analysts have proposed plans to create reasonable rural waste assortment gear in rustic regions. The "Green Fuel" program expects to take care of the issue of tracking down the correct innovation for limited scope activity (<100 kg/h). They are made of wet, green materials, rather than covering them and afterward drying with sun oriented energy. Man-made group work is likewise being finished.

Bigger clusters are framed by coconut shell dust nearby between the metal plates. The lime is blended in with coconut shell debris to prepare the load for handling after sun openness. This methodology desires to give an economical method to create bunches on huge and little plants. Manual pressing factor can't be created to deliver sufficient strain to separate cell dividers, so they can't create thick cones. This implies that they can't meet any significant distance to save travel costs.

Since the utilization of hand devices can be restricted in unique conditions, one of the issues in its development is that it is hard to legitimize the creation of a particular work machine because of the great beginning expenses. One of the hindrances of this is that. The principal occupation of cutting, blending and taking care of is messy and proficient; the genuine interaction of making agglomerates is the most straightforward.

2.4.1 Briquette Combustion

Biomass briquettes are a biofuel hotspot for coal and coal. Briquette is broadly utilized in creating lands, where cooking oil is scant. In created nations the utilization of briquettes has been utilized. In briquettes, briquettes are utilized to warm mechanical boilers to create power from steam. Briquettes are blended in with coal to create evaporator heat.

2.4.2 Combustion In Industrial Boilers

Experience has shown that modern boilers are hot and effectively available briquette hardware. Nonetheless, the scope of plants can straightforwardly utilize manufacturing plant briquettes intended to utilize strong fills like wood or coal. It is feasible to change over oil plants into strong fills, however at a greater cost. This implies that briquettes can be handily bought in the mechanical area in those nations where coal or wood is the premise.

The advantages of simple dealing with and transportation of briquettes identified with untreated buildup reach out to the fire gadget. This implies that regardless of whether the industrial facility can deal with uncooked deposits, the vast majority of the buildups can be scorched well when an arrangement is composed. In spite of the fact that it is hard to acquire exact information much of the time, this expansion in proficiency alone is adequate to demonstrate the consolidation.

A typical issue that is experienced when consuming non-renewable energy sources is that it is hard to send handled items to the plant, and in a chimney, open trash can be blown around and can be totally singed. Briquette dodges these two issues. There is nothing but bad information on the deficiency of fire productivity from consuming unique deposits. In India, natural rice husks are said to show a 20% reduction in effectiveness contrasted with rice briquette, albeit this did not depend on severe norms. General experience has shown that briquettes are a decent wellspring of wood, are of acceptable quality, and can make the value high.

In wood. There are practically no quantitative information on the ignition attributes of coal pellets in mechanical plants like boilers or different furnaces. General experience has shown that they are acceptable materials that can supplant wood, are predictable quality, and can make the cost higher than wood.

2.4.3 Combustion in Household Stoves

It appears to be that briquettes are regularly scorched in the business. Nonetheless, the most recent interest is the utilization of briquettes in houses in nations where wood deficiencies and deforestation are hazardous.

Reports from European research facility work can frequently precisely depict the conduct of homegrown briquettes. An investigation directed in the Netherlands showed that six distinct sorts of briquettes were set on five ovens, demonstrating that the capability of the briquettes may not forestall the establishment of briquettes with wood or coal fuel. Thai can ovens function admirably, with warm proficiency somewhere in the range of 33% and 46%.

In light of the consuming conduct of coal, it is more similar to wood than coal. The consuming coal has a high fire and more smoke than coal. In any case, a test report brought up that if the width of the briquettes can rival coal, the briquettes are extricated from rice husks and millet.

Imperviousness to fire tests unmistakably show that huge briquettes, particularly when made of youthful materials with high debris content, for example, rice husks and water hyacinth, are not reasonable for home cooking because of deficient temperature and hard to light. For such bunches, this isn't an issue. Enormous wooden bars with a breadth of around 8-10 cm on huge cylinder motors seldom consume on indoor ovens.

In an analysis led in Belgium, an ignition test was performed on briquettes to gauge the term of burning and the level of weight reduction. Saw the time when the fire smelled smoke, flares and light. The total finish of this work can be summed up as follows: firm, thick bunches, which swell pretty much during warming, have a lower pace of weight reduction (which means they last more), and It consumes without blazes for quite a while, similarly as large as coal.

In delicate briquettes, the circumstance is the polar opposite, which implies that they grow quicker and start to break for this situation, expanding the pace of weightlessness and shortening the length of a total consume. This conduct is particularly normal for pressure driven cylinder compacts.

As of late, in Sudan, a great many huge loads of nut shell briquette made by huge cylinder machines were offered to homegrown clients in Syan. As per reports, regardless of whether the clusters must be isolated, they were exceptionally happy with the fire work.

In Thailand, there are a few encounters of selling blossom groups in houses made of rice husk and wood chips. Rice husk items appear to be dangerous because of their debris content, yet can be ignited with good wood pellets. The issue with acknowledgment is cost as opposed to quality.

There is likewise some involvement with the utilization of charcoal synthetic compounds made by joining ignition deposits with molasses. The outcomes are opposing, which might be identified with various cooking conditions utilizing briquettes.

In India, difficult issues were found when convincing houses or little cafés to consume briquettes containing molasses. Contrasted and coal or briquettes, there have been objections about its smell and consuming rate.

Then again, in Sudan, statistical surveying on coal-terminated straw produced using cotton stalks has been affirmed for use in charcoal. The high debris substance of Indian briquettes might be an impediment, yet it doesn't mess smell up.

2.5 DESIGN, DEVELOPMENT AND PERFORMANCE OF BRIQUETTING MACHINE

Grover and Mishra (1994) considered the improvement of biomass agglomerates reasonable for creation and use in non-industrial nations. As indicated by reports, the screw limit of the expulsion briquetting machine is 400kg/h, and the briquette thickness is 55mm. It was likewise seen that the necessary force utilization is around 60 kWh/ton.

Mathur (1996) considered the plenitude of biomass. The pilot machine was intended to meet the fuel needs of the tried valleys. Coal and slide are utilized to make agglomerates. It was tracked down that the limit of the chronicle machine was around 45 kg briquettes each day. The machine is fueled by a 0.75 kW electric motor. The effectiveness of machine briquetting is somewhere in the range of 77.1% and 90.3%.

Toanet et al. (2000) considered the improvement of cutting edge dating machines too As per reports, the limit of the machine is 80-90 kg/h. The speed of the screw is 200-240 and is driven by 11 pull vehicles. All out power utilization is approx 0.13 kW-h/kg, the joined breadth is around 71 mm. Basically barrel caps and espresso sheets are financially savvy and have high potential for changing wood for cooking at home.

Bhattacharya et al. (2002) contemplated progressed biomass agglomerate and built up a hot agglomerate squeezing machine at a normal pace of 90 kg/h. It is driven by a 20-check electric vehicle to drive the screw, and it drives the screw at 385 rpm. Drum sticks with a 8% dampness content have been discovered to be reasonable for briquetting.

Shakya et al. (2004) Improved shape temperature compacted a flying machine. The vehicle drives a square screw embedded into the form with a V-belt and pulley gadget. The electric transporter greases up the lignin in the crude material utilized as restricting material (makes it pass form). The vent gas catch framework catches and eliminates close by pipe gas during the shooting interaction.

Bhattacharya and Kumar (2005) proposed a handout called "Innovation Package" created by "Biomass Briquetting Group". An examination was presented on a hot screw machine. As per reports The length of the screw is 450 mm, the external breadth is 55 mm, the length of the table is 300 mm, and the width of the table is 97 mm. The creation machine is accounted for to be 80 kg/h.

Sharma (2005) examined the assembling and testing of agrarian waste/crop squander hardware. A barrel shaped cylinder is given to interface the agrarian buildups. Toward the finish of the line, a 10 cm long shape is given. Under the shape is It is 3.75 cm long and 2.5 cm wide. The container is organized in the focal point of the barrel shaped cylinder to take care of the engraving into the round and hollow body. The machine is driven by a 2 hp acceptance engine. With the assistance of a decrease, the speed of the vehicle is diminished by a proportion of 1:20. Mass with a breadth of 25 mm and a length of 25 mm. Obviously, around 216 briquettes are delivered each hour.

Abkar and Abased (2006) led exploratory tests on a round cotton fleece screwdriver in Sudan. It was discovered that when the dampness substance of the crude material was changed in accordance with 35%, the ideal yield was 198 kg/h. The end is that because of the steady closure of the hardware, low dampness content prompts lower creation.

Sathitruangacit al. (2006) He led an examination planning an expulsion screw to deliver biomass strong fuel through a chilly expulsion measure. The impact of molasses utilized as a particular fixing in the concentrates of the removed items was contemplated. This was comprised of squashed coconut charcoal and blended coconut charcoal 40:40. 1.0, 1.1, 1.2,

and 1.3 degree inclinations, individually. Test outcomes show that the planned screw can work ordinarily inside the extraction scope of 0.75-0.90 kg/min. The measure of electrical energy utilized in the expulsion cycle isn't enormous, between 0.040-0.079 kWh/kg.

Singh et al. (2007) considered the improvement of briquetting machines. Nut shell powder (1180-150 grams) is utilized to make biomass pellets. Utilizing 35mm forms and impacting gadgets, the creation of 35mm briquettes made of nut shells is palatable. The chronicle limit is 270 kg/h. Contrasted with 60 mm briquettes (56 kW-h), the interest for power per ton of briquettes is high (67 kWh).

Mandwe (2010) was planned and created with a printing machine that can press harmless to the ecosystem fuel motors. Passings that are 90 mm wide and 210 mm long are normal Fix blossoms. Machine limit is 150 kg/h Driven by belts and pulleys, the vehicle can yield 15.87 kW. The warming framework comprises of a 2 hp engine screw with a distance across of 250 mm and a length of 1250 mm. It is intended to warm biomass up to 120°C to create solid bunches.

Tayadeet. (2010) Visible light and warm properties were concentrated with cylinder and screw press. Youthful nuts, residue and soybean buildup are utilized to make briquettes. Utilize a 20-foot screwdriver with a 5mm worm. The account limit is 1500kg/h.

Sengaret et al. (2012) considered Split the fuel. Utilize carbonized ground shells, grass and drumsticks to make bunches. In the focal force utilization machine, the current that should be recorded by the force source is 220 and 3 amperes. The normal limit of the screw briquetting machine is 35 kg/h, and the normal energy utilization is around 18 kcal/kg of blended fuel.

Nayak et al. (2013) Researched a screw briquetting machine dependent on jute charcoal. The screw width is 160mm, the screw length is 600mm, the opening breadth is 30mm, the cutting length is 120mm, and a synthesizer is utilized to supply capacity to 440 volts. The limit of the recorder is 25 kg/h.

CHAPTER 3

MATERIALS AND METHODS

For this purpose of the study, mild steel is used for the construction of the machine. Mild steel plates and rods were brought from a local mild steel market at Guindy Industrial Market in Chennai. The machine is fabricated inside our college premises. The machine is fabricated using electrical arc welding.

3.1 CONCEPTUAL DESIGN

Conceptual Design 1:

The idea configuration works with the assistance of an electric vehicle. Biomass material blockage is the consequence of a pivoting screw, which presses the form material under high tension (high pressing factor framework).

The second plan idea is utilizing vehicle jacks for compaction work. It works by squeezing the biomass device on a shut top (cover) with an assortment of cylinders.

The third idea configuration is a hand-held switch machine. It works by squeezing the biomass material into a round shape, and just a single time at a time.

Two applied plans were picked on the grounds that they produce more briquettes all at once, instead of the one-size-fits-all plan idea.

As per its pressing factor, biomass hardening frameworks can be separated into three classes. The primary classification is high-pressure machines with pressures over 100 MPa. This sort is appropriate for deposits with high lignin content. The temperature ascends to 200 to 250 under high tension °C, enough to tie the substance of lignin in the buildup, which assumes the part of bond, thusly, there is no compelling reason to add restricting materials.

The third class is low-pressure machines working at pressures under 5 MPa and room temperature. The third kind of apparatus requires the expansion of restricting materials, and because of the absence of lignin materials in the carbon creation measure, it is viewed as the most reasonable sort of carbon material. The yield fluctuates from 35 to 1800 kg/h, contingent upon the perished, the sort of compacted material and its exhibition.

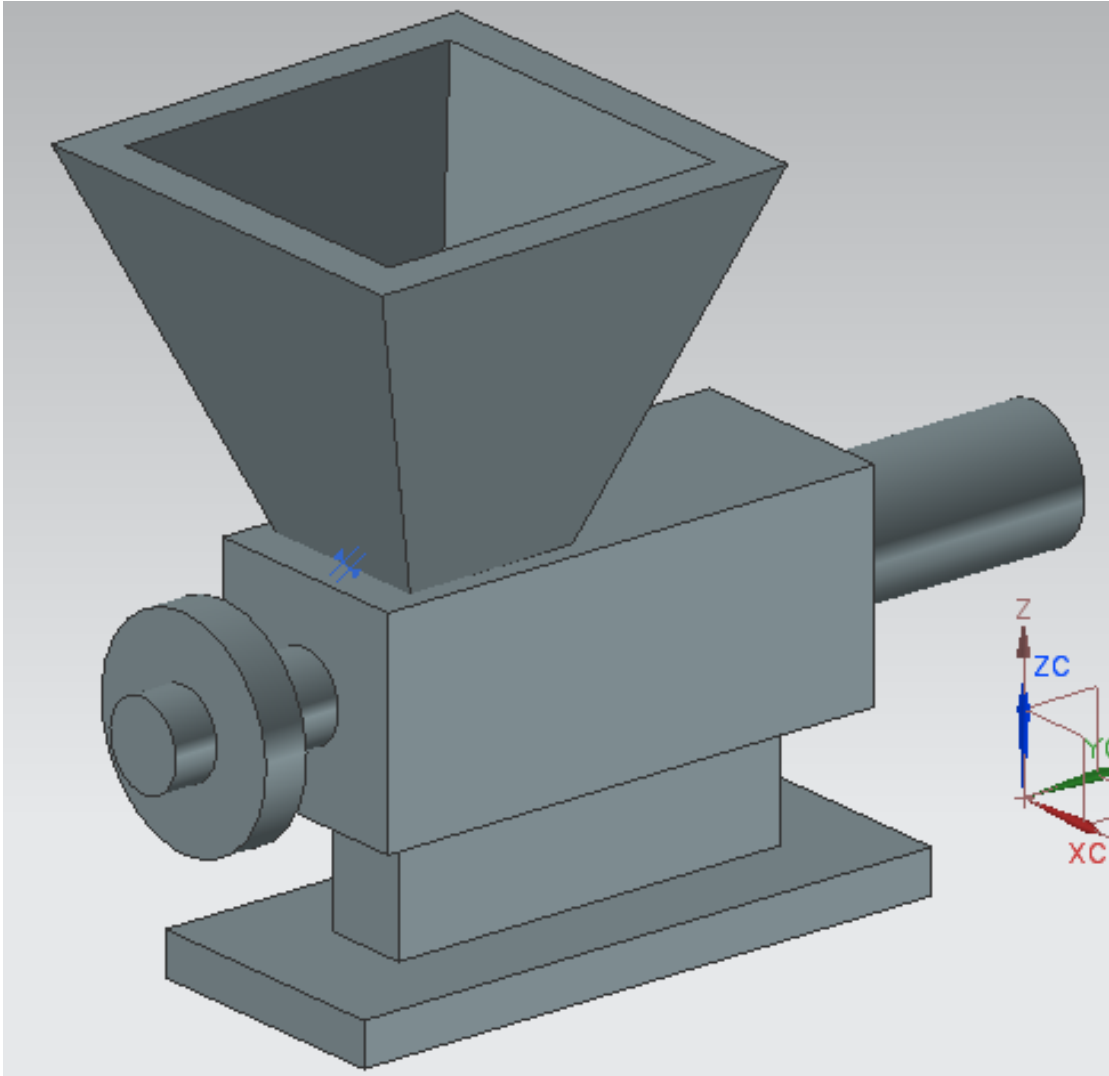


Fig. 3.1: Motorized Piston Press Briquetting Machine

Conceptual Design 2:

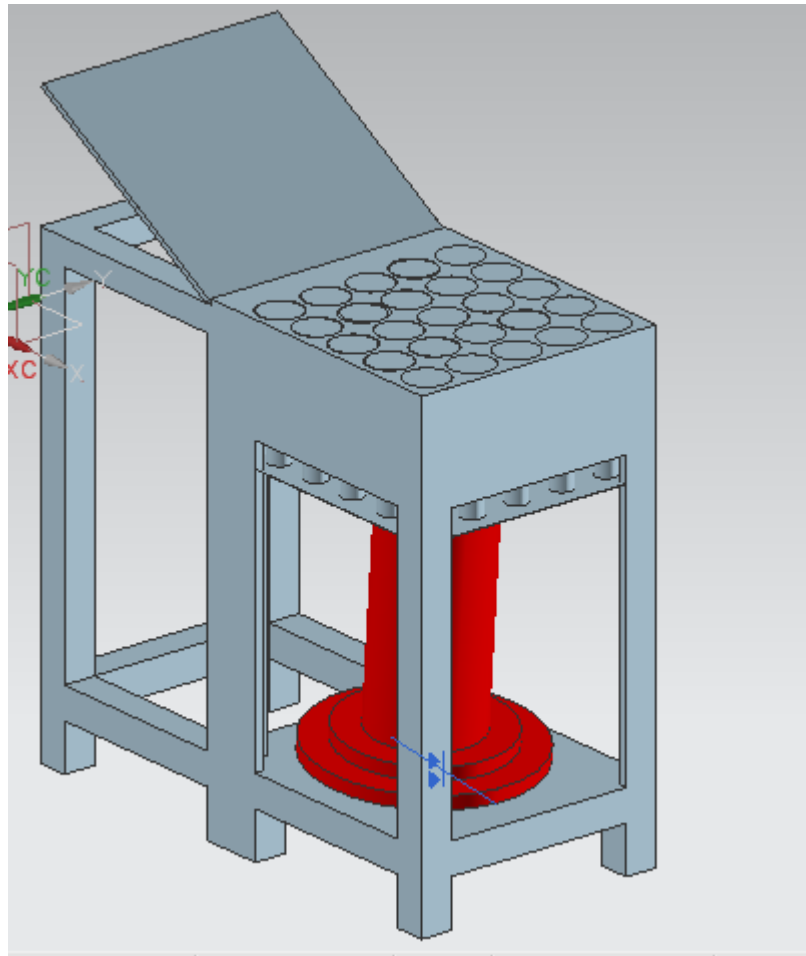


Fig. 3.2: Multiple briquetting piston press using hydraulic jack

Conceptual Design 3:

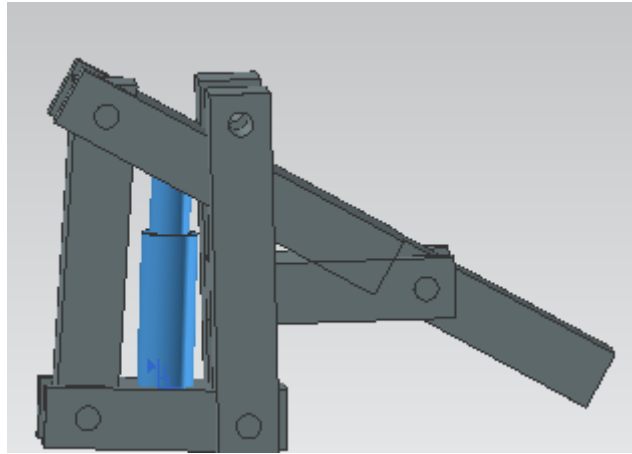


Fig. 3.3: Hand operated manual briquetting press

The idea configuration works with the assistance of an electric vehicle. Biomass material blockage is the consequence of a pivoting screw, which presses the form material under high tension (high pressing factor framework).

The second plan idea is utilizing vehicle jacks for compaction work. It works by squeezing the biomass device on a shut top (cover) with an assortment of cylinders.

The third idea configuration is a hand-held switch machine. It works by squeezing the biomass material into a round shape, and just a single time at a time.

Two applied plans were picked on the grounds that they produce more briquettes all at once, instead of the one-size-fits-all plan idea.

3.2 PROBLEM FORMULATION:

Machine which are having complicated geometry are difficult to analyze. In this work, hydraulic jack of 3 tons capacity is used. Analytical and numerical results are compared to validate the results.

3.2.1 Design pre-requisite:

Hydraulic press system is to be designed according to the requisites offollowing:

3 tons of operating force 150 bar cylinder pressureStroke length 220 mm Capacity force is 3000 kg

3.2.2 Assumptions made for piston rod:

Bar is straight and homogenous material

Rod is continuous and no abrupt changes occur

Line of force acting coincides with the axis of rod

3.3 METHODOLOGY:

A starter test was directed to decide the necessary pressing factor estimation (pressure) and the sort of shape to be utilized. It was tracked down that a 6 cm shape would frame clusters. The accompanying plan prerequisites were gotten from the underlying test: composite proportion, shape arrangement, compressibility and compressive strength. The plan contemplations for the applied plan pointed toward meeting operational prerequisites were resolved, including: materials utilized, convenience, machine size, machine climate, stockpiling, security, and cost.

As per its pressing factor, biomass hardening frameworks can be separated into three classes. The primary classification is high-pressure machines with pressures over 100 MPa. This sort is appropriate for deposits with high lignin content. The temperature ascends to 200 to 250 under high tension °C, enough to tie the substance of lignin in the buildup, which assumes the part of bond, thusly, there is no compelling reason to add restricting materials.

The second is a medium pressing factor machine with a pressing factor scope of 5 MPa to 100 MPa, accordingly lessening heat age. Much of the time, this sort of gear requires the utilization of an extra warmth source to break up the interior lignin substance of the feed station, consequently wiping out the requirement for extra holding.

The third class is low-pressure machines working at pressures under 5 MPa and room temperature. The third kind of apparatus requires the expansion of restricting materials, and because of the absence of lignin materials in the carbon creation measure, it is viewed as the most reasonable sort of carbon material. The yield fluctuates from 35 to 1800 kg/h, contingent upon the perished, the sort of compacted material and its exhibition.

The reason for this work is to plan a recording device, design a briquetting machine and test it. Along these lines, the task work includes the plan, plan and testing of the scanner activity.

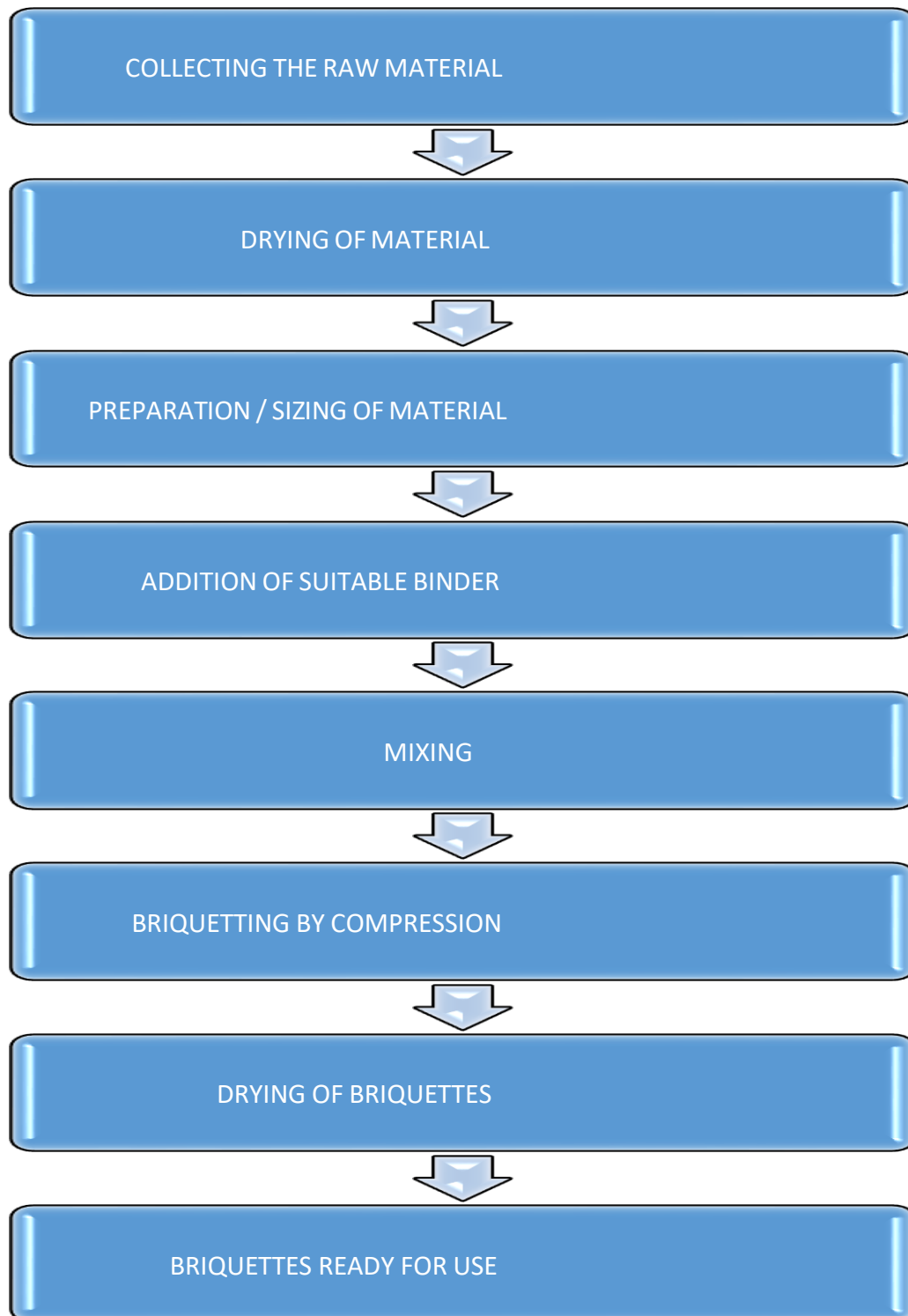


Fig 3.4: Process Flow Diagram for Briquetting

3.4 CONCEPTUAL DESIGN AND CALCULATION

The conceptual diagram of the machine is shown in figure with the under listed design specifications used. The capacity of the machine was put at 240 briquettes per shift.

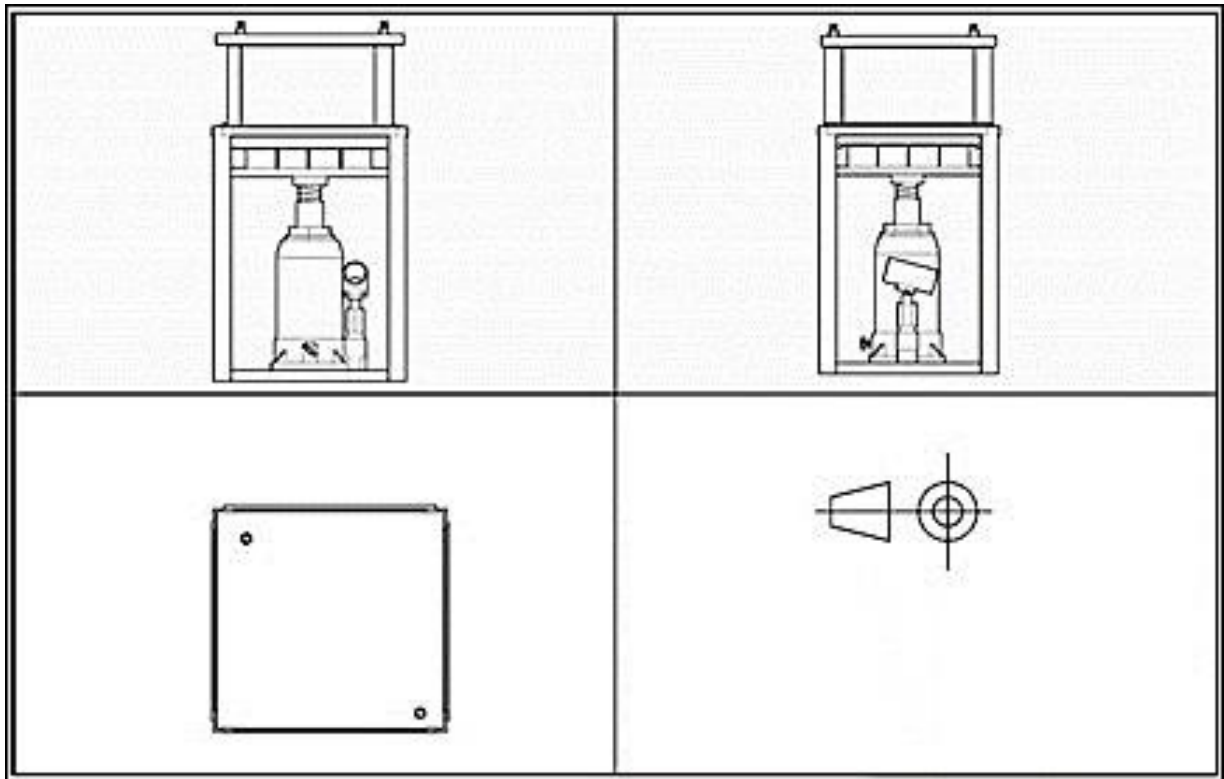


Fig 3.5: Conceptual diagram of the machine

3.5 DESIGN SPECIFICATIONS:

Hydraulic jack capacity for this project is 3 tons

Number of cylinders 4

The piston is fixed at both ends

Design calculation:

The summary of design calculations for parameters used in the development.

Compaction pressure $P = \frac{F}{A}$

$$\text{Thickness of cylinder wall } t = \frac{P.d}{2\sigma_c}$$

$$\text{Maximum shear stress in the cylinder } \tau_s = \frac{P.d}{8.t}$$

$$\text{Cylinder volume } V = b.w.t$$

$$\text{Mean breaking stress of the piston rod } P = \frac{\sigma_c A}{1+a\left(\frac{l_c}{k}\right)^2}$$

$$\text{Thickness of the bottom plate } t = \sqrt[3]{\frac{K.F.b^2}{E\delta^2}}$$

$$\text{Size of welded joints } s = \frac{F}{2 \times 0.707 \times l \times \sigma}$$

3.6 DESIGN OF MACHINE ELEMENT AND MATERIAL SELECTION:

Properties of mild steel

- Ultimate strength – 400 MPa
- Yield strength (tension) – 250 MPa
- Yield strength (shear) – 145 MPa
- Modulus of elasticity – 200 GPa
- Modulus of rigidity – 77.2 GPa
- Density – 7860 g/m³
- Co-efficient of thermal expansion – 11.7 GPa
- Poisons ratio – 0.3

3.6.1 Mould

$$\text{Briquette cross sectional area (A)} = \pi * d^2 = \pi * \frac{6^2}{4} = 28.26 \text{ cm}^2$$

Total area = single cross section x number of briquettes

$$= 28.26 \times 4 = 113 \text{ cm}^2 = 0.0113 \text{ m}^2$$

Design pressure (P) = 1 MPa

Force applied (F) = Total area x Design Pressure

$$= 0.0113 \times 1 \times 10^5$$

$$= 1130 \text{ N} < 30000 \text{ N}$$

10 tons of hydraulic press generates 10000 kg force. So, the corresponding force applied by the hydraulic jack is 100000 N. Here, expected briquette application pressure is estimated as 98000 N. So, the force applied is within the limit.

3.7 DESCRIPTION OF THE MACHINE

The plan of the coal briquette machine depends on the law of (pressure). Biomass is compacted into a turning boring apparatus, consequently blowing it into form. The machine works physically with a water powered framework to create the necessary pressing factor in the pressing factor. The water powered jack has a switch handle that drives the oil strain to make a pressing factor contrast in the expert chamber. This pushes the cylinder that presses the biomass stacked with the shape. This figure shows a genuine model of a biomass briquetting machine.

The pressure driven briquetting machine comprises of five principle parts: enormous edge and form, barrel shaped strain spring, cylinder bar plate base and water driven framework, including: water stockpiling tank, water powered chamber (huge siphon). The front edge is welded with 75 mm x 10 mm level steel and points of different lengths 40 mm x 50 mm to frame a square shape with a breadth of 1155 mm x 300 mm x 80 mm. The form is situated on top of the edge and is made of 10 mm thick steel (chamber with open edges). There are two impacting unveils blowing to the two sides of the casing. A steel wire with a distance across of 2 mm is harmed to frame a spring with a width of 2 mm. The ANA territory is 130 mm x 120 mm. The water driven framework is utilized as a force/pressure move framework. The water powered cylinder is driven by a high blow, sends a huge power to advance the holding of the material, and assumes a part in eliminating forceful agglomerates from the shape. Tube shaped helical pressure spring is utilized as a pressure cylinder substitution. Spring is made of strong carbon steel. This is a typical spring metal and must be utilized where there is life. Exactness and deviation are not significant. Material size: 0.8 mm to 12 mm. Its working reach is 0 to 120 ° C



Fig 3.6: Developed Briquetting machine

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Testing And Results

The calorimeter of the gadget can be utilized to peruse the temperature change in a particular framework. Calorimeter is gotten from the Latin "color" (heat), which means heat, while the Greek word "metric" signifies estimating the temperature of the framework. The most recent advances in calorimeter and hardware can help clients save tests in proper conditions for simple examination. The Scottish specialist Joseph Black was quick to recognize hot and cold, and was known as the "organizer of calorimeter." As we as a whole know, the advanced calorie procedure is ascribed to the French scientist Pierre Eugene Berthelot (1827-1907). He considered the issues identified with temperature estimation and built up the principal present day calorimeter.

4.2 THERMAL PROPERTIES: CALORIFIC VALUE

The calorific estimation of strong fat and fluid is resolved utilizing a bomb calorimeter. It is resolved by the standard methodology of ASTM E-711. The bomb's calorimeter (producer: Parr, oxygen bomb calorimeter) was outfitted with a strong treated steel bomb, in which a fire broke out. The bomb is set on a copper calorie with an air coat and a water coat around the copper calorie to forestall heat misfortune because of radiation. Spot the heaviness of fuel (under 1 gram) on a perfect pot upheld by the ring, fix the circuit, and fill the bomb with oxygen at 25-30 air pressure.

After the bomb was brought down to a copper calorimeter containing a known measure of water, it was supplanted and the principal temperature was noticed. The anode bomb is associated with the wire cutting edge to touch off the bomb. As the fuel bursts into flames, heat is delivered and the water temperature around the bomb rises. An expansion in water temperature was seen in the calorimeter until the encompassing temperature was found. The temperature rise is expected to Fuel burning is additionally used to decide the estimation of fuel costs. Utilize the calorie estimation setting set by the bomb calorimeter.

4.3 DETERMINATION OF WATER EQUIVALENT OF CALORIMETER

In light of expanding the temperature of the article by a specific worth, a similar temperature can build the temperature of a similar measure of water simultaneously. It is said that the measure of water is equivalent to water.

4.3.1 Principle:

The calorie procedure can be utilized to examine temperature changes related with compound responses. By deducting a specific measure of warmth that raises the temperature of an item by a specific sum, a similar measure of warmth can expand a similar temperature of a specific measure of water simultaneously, accepting that the temperature of the particular water is one calorie for every gram. It is said that the measure of water is equivalent to water.

4.3.2 Procedure

Bomb calorimeter is probably the best device for estimating calorie content in powdered and fluid oil. Gas consumes in a strong metal chamber called a bomb, which is loaded up with many known waters. At a pressing factor of 25 to 30 climates, fuel is siphoned into the openings in the oxygen-filled bomb. At that point use platinum or magnesium wire to warm it electrically. Decide the warmth and fuel limit delivered by the increment in water temperature around the bomb

Calorie admission is the main part of fuel. A 50 g biomass test was estimated on the pot, and a 10 cm long wire (nickel-chromium wire about 0.1 mm wide) was blown between the anodes. Undoubtedly, while the bomb head was being put, the fence was exceptionally near the paraffin. While eliminating the bomb head from the help region to the bomb rack, care should be taken not to upset the example. To retain the burning results of sulfur and nitrogen, 10 milliliters of water was added to the bomb. The bomb is associated with the oxygen chamber through an air valve and a drill opening. Bring oxygen into the bomb and change the strain to 25 to 30 climates. The bomb was then positioned in 3000 g of refined water in the interior calorie compartment. Make the important electrical associations. The water in the calorimeter is continually moving and the temperature is observed. By looking at the briquettes created by the production line with the briquettes delivered by our briquetting machine, the cost of calories can measure.

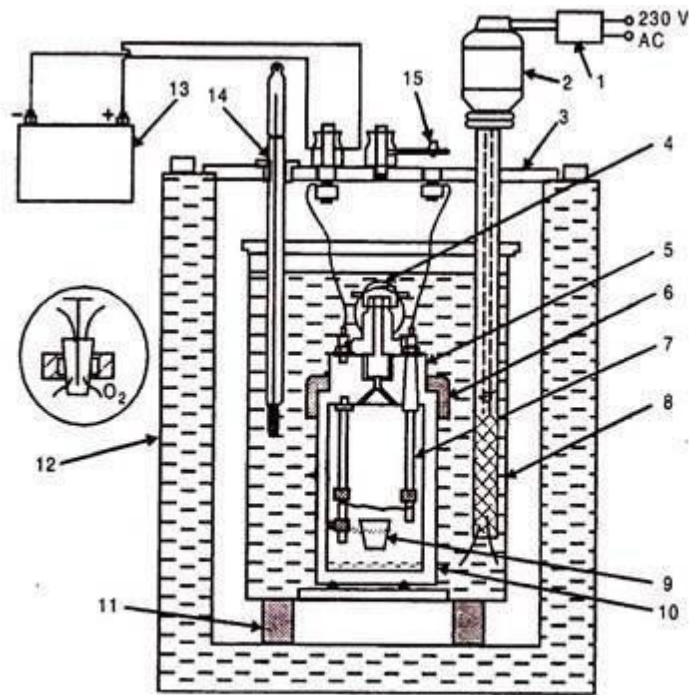


Fig. 13.4. Bomb calorimeter

1. Rheostat, 2. Motor, 3. Cover, 4. Cap, 5. Lid, 6. Union Nut, 7. Electrode, 8. Calorimeter vessel, 9. Crucible, 10. Bomb, 11. Support, 12. Outer vessel, 13. Battery, 14. Thermometer, 15. Key

Fig 4.1; Oxygen Bomb Calorimeter

(A) Due to the high oxygen provided pressure, a lot of abundance oxygen is provided, so the ignition power is depleted.

(B) When the measure of fire stays consistent, all the delivered warmth will be moved to the encompassing water.

(C) Adding oxygen and limited quantities of water (typically 10 cc) to the blast won't influence the fire limit.

(D) Test strategies and accessible courses of action are joined by a precise estimation of temperature misfortune revision (cooling amendment).

The calorimeter comprises of a treated steel compartment called a bomb, which is put in a calorie holder. The bomb is additionally made of metal Monel. The calorimeter is put in a chromed holder with two wires in water. The calorie surface is covered with a carbide cover with concrete.

This is on the grounds that the radiation misfortunes in the general climate are diminished. Give an electric shooter to move the water in the compartment. The mercury in a glass thermometer has a precision of at the very least 0.01°C and is utilized to quantify the temperature of the water around the bomb. The Beckman thermometer is utilized for this.

By and large, silica cauldrons are utilized to store fuel. To fill the bomb with oxygen, the essential hardware, for example, copper pipes, pressure checks, and control valves on oxygen chambers, should be given. For testing, a 4 or 12 volt battery is required.

Measure around 1 gram of fuel for each cauldron. At that point empty 10 meters of water into the bomb. At the point when strong fuel (like coal) is utilized, it is ground into a fine powder, at that point a plate is made by hand pressure, and a cotton string is embedded and joined to two terminals when the plate is readied. The pot is held in a ring associated with two terminals. At that point fix the cover or fixed top.

From that point onward, the bomb was associated with the oxygen chamber by a pressing factor pipe and a copper pipe. The bomb is loaded up with 25-30 bar of oxygen. At that point take a rough measure of water so the water doesn't stream in the halls (typically, the worth can be 1500 cc or 2500 cc). The terminal engine is associated with the primary force source, and the cathode is associated with the battery by tapping.

In the wake of finishing this setting, you can set a test or test:

(1) Preliminary Period:

Start the energizer so the water temperature in the calorimeter stays as before and the equivalent. Require read each moment until the temperature is equivalent, and afterward keep perusing 2-3 times. This normally requires 5 minutes.

(2) Main Period:

However long the temperature in the calorimeter is something very similar, the fuel can be warmed by squeezing the blow key, so it presently streams into the breaker and consumes. A cotton string is connected to the wire to light the fuel plate and delivery it the warmth. Keep on taking the temperature perusing for 1 moment until the most extreme temperature is reached.

(3) After Period:

In the wake of arriving at a most extreme temperature, the temperature will start to diminish. Keep on taking temperature readings briefly. Take 10-15 readings, at that point stop the test. Eliminate the bomb from the calorimeter and delivery the pressing factor by opening the valve. In the wake of eliminating the bomb cover, measure the measure of water in the bomb. This distinction in water will be the heaviness of H₂O framed because of the hydrogen fire in the fuel. This weight is vital for estimating or acquiring a base measure of fuel temperature. Subsequent to estimating the cauldron, the fuel substance of the fuel can likewise be found.

Calorie admission is the main part of fuel. A 50 g biomass test was estimated on the pot, and a 10 cm long wire (nickel-chromium wire about 0.1 mm wide) was blown between the anodes. Undoubtedly, while the bomb head was being put, the fence was exceptionally near the paraffin. While eliminating the bomb head from the help region to the bomb rack, care should be taken not to upset the example. To retain the burning results of sulfur and nitrogen, 10 milliliters of water was added to the bomb. The bomb is associated with the oxygen chamber through an air valve and a drill opening. Bring oxygen into the bomb and change the strain to 25 to 30 climates. The bomb was then positioned in 3000 g of refined water in the interior calorie compartment. Make the important electrical associations. The water in the calorimeter is continually moving and the temperature is observed. By looking at the briquettes created by the production line with the briquettes delivered by our briquetting machine, the cost of calories can measure up.

4.4 PHYSICAL PROPERTIES: BULK DENSITY

The greater part of the materials are resolved through traditional cycles. Utilize 1000ml (1000cm³) round holder assurance. The compartment is purged to decide its size, at that point loaded up with the example and weighed once more. The amount is controlled by partitioning the size of the item by the volume of the holder. Bulk density of the samples are varied between 650 kg/m³ to 850 kg/m³.



Fig 4.2: Starch Binder

Calorie admission is the main part of fuel. A 50 g biomass test was estimated on the pot, and a 10 cm long wire (nickel-chromium wire about 0.1 mm wide) was blown between the anodes. Undoubtedly, while the bomb head was being put, the fence was exceptionally near the paraffin. While eliminating the bomb head from the help region to the bomb rack, care should be taken not to upset the example. To retain the burning results of sulfur and nitrogen, 10 milliliters of water was added to the bomb. The bomb is associated with the oxygen chamber through an air valve and a drill opening. Bring oxygen into the bomb and change the strain to 25 to 30 climates. The bomb was then positioned in 3000 g of refined water in the interior calorie compartment. Make the important electrical associations. The water in the calorimeter is continually moving and the temperature is observed. By looking at the briquettes created by the production line with the briquettes delivered by our briquetting machine, the cost of calories can measure up.



Fig 4.3: Mixtures of Saw Dust with Binder



Fig 4.4: Finished Briquette Samples

CHAPTER 5

5.1 CONCLUSION

In this study the following conclusions were arrived at: It was designed and manufactured by hand-made biomass briquetting machine suitable for small production of biomass briquette, with a production capacity of 250 kg / h, and used in the production of sawdust soil with starch binder Material clumps. It is found that the visible properties of dust agglomerates are significantly affected by the particle size and binder content.

Use a built-in briquetting machine to produce briquettes with high durability. Although to obtain the highest quality briquettes, their maximum size, initial handling strength and durability should be considered, particles less than or equal to 2mm and 6mm should be used, and the mixing ratio should be 75:25. It was confirmed that a calorie value of 5.95MJ / kg was obtained, and the agglomerate temperature characteristics produced by the machine were recorded.

It is recommended that further research be conducted in the following areas: Use a different biomass to find machine capacity for different particle sizes and binder levels. Introduce electrically operated pistons to compress instead of hand-held pressure jars.

A manual biomass briquetting machine suitable for the production of biomass briquettes on a small scale with a production capacity of 250 kg/h was designed and constructed and used in the production of biomass briquettes saw dust with starch binder.

The physical properties of the saw dust briquette were found to be significantly affected by the particles size and binder level.

Briquette with higher durability was produced using the constructed briquetting machine. Though for best saw dust briquette quality on the basis of relaxed density initial handing strength and durability particle size less than or equal to 2mm and 6mm with a binder blending ratio of 75:25 should be used.

Determined the heating value of 5.95 MJ/kg was obtained and the combustion properties of the briquette produced by the machine was recorded.

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ANNEXURE I



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TEST REPORT				
Sample Ref No. : EES/MM/077/03			Report No. : 388/03	
Issued To: Sathyabama Institute of Science and Technology Sholinganallur, Chennai			Report Date : 19.02.21 Page: 1 of 1	
Sample Description : Briquette Sample Drawn By /Date : Customer / 15.02.21 Customer's Reference : Letter dated on 15.02.21 Sample Mark : Sample - 1			Received On : 15.02.21 Commenced On : 15.02.21 Completed On : 19.02.21	
Sl.No	PARAMETERS	UNITS	RESULTS	PROTOCOL
1	Gross Calorific Value	Cals/g	5950	IS: 1350 (Part 2) 1984 R.2009

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