Mechanization of bricks manufacturing

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***Abstract*— The provision of shelter is one the most basic demand of a Man all over the World. It is one the most important challenges a man faces in his life. The problem of good shelter varies from place to place. A good shelter provides, first and foremost Security and Privacy. It is an undisputed fact that shelter is one of the basic human necessities. However, irrespective of the importance of shelter, most people do not have access to good shelter, most especially in developing countries. Now a days time is more precious so people want to complete the work in less time so in building shelter bricks are the vital components that cannot be replaced by any another subsidiaries. Thus, the machine is very affordable for small scale enterprise (SME). In other words, bricks or blocks produced by using this machine are relatively cheap and affordable for those in the rural areas and for low income earners.**

***Keywords*— Brick, Frame, Compressive Earth Bricks, Blocks, Rack and pinion mechanism.**

I. Introduction

The history of civilization is synonymous to the history of masonry. Man's first civilization, which started about 6000 years ago, was evident from the remains of the Mesopotamians masonry heritage. During those days, masonry buildings were constructed from any available material at hand. The Mesopotamians used bricks, made from alluvial deposits of the nearby River Euphrates and Tigris to build their cities beside two rivers. Where civilization existed in the vicinity of mountains or rocky outcrops, stone was used. The Egyptian pyramids that existed along the rocky borders of the Nile valley were examples of such stone masonry. In the Eastern civilization, remains of historical masonry are the reputed Great Wall of China, which is considered as one of the seven construction wonders in the world.

1.1 Origin of the word "BRICK"

The word 'brick' was originated from late middle English: from Middle Low German, Middle Dutch 'bricke', probably reinforced by Old French 'brique', of unknown origin or 'briquette', which means a block of compressed coal dust or peat used as fuel-origin late 19th century: French diminutive of brique brick.
The antiquity of bricks can be pushed back to the ancient times. In Sanskrit it was known as 'Aishtakam'.

1.2 Brick Manufacturing Process

The production process of bricks can roughly be divided into several major steps: Clay digging. Clay preparation. Clay mixing. Forming or Molding, Drying, Firing and Cooling.

1.2.1 Clay Digging

Clay is usually dug from the local vicinity of the brick kiln. The clay is then processed as to be free from gravel, lime and other bio wastes/ matter. This soil once excavated is then watered and left for weathering and processing.

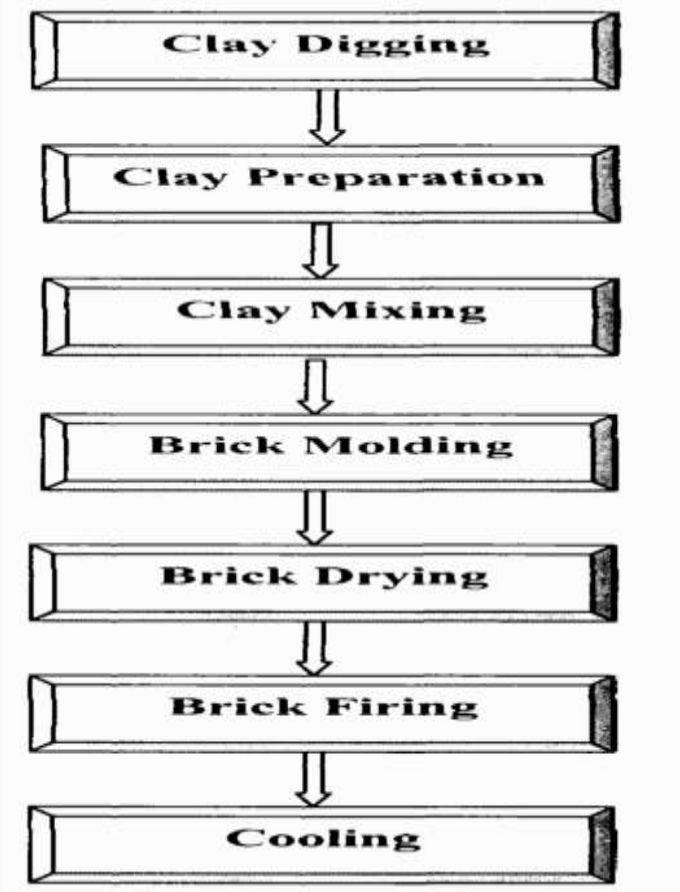


Figure 1.1: Flow Diagram For Brick Manufacturing

Brick making is as ancient as human civilization itself. Great architectural wonders and the immortal monuments built in the antique past had been built with bricks besides stones and mortar. Ever since man realized the housing as basic need, he started using bricks in various forms like green bricks, sun dried bricks and the fired bricks. Today from the humble dwellings to the modern skyscrapers and labyrinthine structures, brick forms the most important building material.

Like the earth withstanding the passage of unimaginable astronomical years, the bricks also, made of earth's clay and soil do withstand even the worst disastrous onslaughts of nature for quite a long time. Myths abound with information about the usage of bricks even in the building of Babel Tower by the King Solomen.

Today, one cannot imagine a construction at the exclusion of bricks and such is the importance that bricks have assumed as a building material.

The prevision of good quality housing is recognized as an important responsibility for welfare of people in any country. For this, building materials based on natural resources are often used. Some examples are the use of clay for making bricks, and river sand for making cement sand blocks. The commercial exploitation of these resources often leads to various environmental problems.

II. LITERATURE REVIEW

It is an undisputed fact that shelter is one of the basic human necessities. However, irrespective of the importance of shelter, most people do not have access to good shelter, most especially in developing countries. In fact there is an estimated deficit of between 17 and 18 million housing units in Nigeria in 2012, [1]. The poor are most adversely affected by this housing shortage. The most important building materials for low-cost housing are blocks/bricks [2], but conventional quality concrete blocks are too expensive for low-income communities. Due to high cost of Portland cement, a lot of block producer's use less than the recommended amount in the concrete mix making the blocks to be substandard. This is one of the most important contributing factors for the frequent building collapse in the country recently. Bricks / Blocks are solid pieces of hard substances, usually with flat sides, used as construction units [3]. They are sometimes referred to as masonry units (MU). Block and brick masonry are strong, fire-resistant, insect-proof building materials. They have a lot of thermal mass, which helps them retain heat and makes up for their relatively low insulation value. However, despite their similarities, block and brick have some major differences: Blocks are bigger in size as compared to bricks; blocks are usually made of concrete and hollow, while bricks, on the other hand, are smaller usually made of clay or other earthen materials and solid [4].

III. WORKING PRINCIPLE

Components of machine:

1. Metal sheet
2. L-angles
3. wheels and washers
4. wire rope
5. bearings
6. iron rod

Metal sheet

Metal sheet formed by an industrial process into thin, flat pieces. It is one of the fundamental forms used in metalworking and it can be cut and bent into a variety of shapes. Countless everyday objects are fabricated from sheet metal. Thicknesses can vary significantly; extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate.

Sheet metal is available in flat pieces or coiled strips. The coils are formed by running a continuous sheet of metal through a roll slitter.

Metal Sheet

L-angles:

An angle iron is a flat metal rod that has been folded to a 90-degree angle along its length, resulting in an L-shaped piece. Usually the two sides of the angle are of equal length. Heavier angle iron is often a structural element in buildings, bridges, and so on, while a lighter version is used for a variety of supports. An adjustable bed frame, for example, is made of this material.

L-angles

Wheels and washers:

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines. Wheels

are also used for other purposes, such as a ship's wheel, steering wheel, potter's wheel and flywheel.

Washer:

A washer is a thin plate (typically disk-shaped) with a hole (typically in the middle) that is normally used to distribute the load of a threaded fastener, such as a screw or nut. Other uses are as a spacer, spring (Belleville, wave washer), wear pad, preload indicating device, locking device, and to reduce vibration (rubber washer). Washers usually have an outer diameter (OD) about twice larger than their inner diameter (ID).

Washers are usually metal or plastic. High-quality bolted joints require hardened steel washers to prevent the loss of pre-load due to Brinelling after the torque is applied.

Wire rope:

Wire rope is rope made from wire. It consists of several strands of metal wire laid (twisted) into a helix. The term "cable" is often used interchangeably with "wire rope", but narrower senses exist in which "wire rope" refers to diameter larger than 3/8 inch (9.52 mm), whereas sizes smaller than this are designated cable or cords.[1] Initially wrought iron wires were used,but today steel is the main material used for wire ropes.

Bolt and nut:

A bolt is a form of threaded fastener with an external male thread. Bolts are thus closely related to, and often confused with, screws.

Bolts are often used to make a bolted joint. This is a combination of the nut applying an axial clamping force and also the shank of the bolt acting as a dowel, pinning the joint against sideways shear forces. For this reason, many bolts have a plain unthreaded shank (called the grip length) as this makes for a better, stronger dowel. The presence of the unthreaded shank has often been given as characteristic of bolts vs. screws, but this is incidental to its use, rather than defining.

Bearings:

A bearing is a machine element that constrains relative motion between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling thevectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by mini mizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts. The term "bearing" is derived from the verb "to bear"; a bearing being a machine element that allows one part to bear (i.e., to support) another. The simplest bearings are bearing surfaces, cut or formed into a part, with

varying degrees of control over the form, size, roughness and location of the surface. Other bearings are separate devices installed into a machine or machine part. The most sophisticated bearings for the most demanding applications are very precise devices; their manufacture requires some of the highest standards of current technology.

Bearings

Iron rod:

Mild steel rods are used for supporting sprockets with the help of bearing. Its main function is to provide equal force over the frame. It acts as axle rod and it provides greater strength.

Mild steel rod

Machine setup:

The machine (equipment) is fabricated in such a way that it is portable, it can be shifted to place where we require.

The prime objective of the project activity is to produce a high-quality, load-bearing and well insulating building material by adopting an efficient low energy intensive brick production process instead of a high energy intensive brick production process like Clay

Brick Bull‟s trench kilns (BTKs) and positively impact the energy consumption pattern both at the brick production level and at the building operation level.

While attaining the prime objective the project activity will also Reduce GHG emissions associated to energy consumption (both fossil fuel and electricity) in the high energy intensive BTKs by an energy efficient brick making technology.

Sheet cutting:

In market we will get a metal sheet of 8*4 inch, take the metal sheet and cut it into required dimensions of 9*4*3 inch blocks with a required capacity of 30 blocks with in a die and the arrange them in a rectangle block manner so that every block shape is similar to each other and in same dimensions.

L-ANGLES CUTTING:

The angular iron must be cut into required dimensions as shown in below figure to hold the base die frame and this internal frame is slide in the external rigid frame, to the external rigid frame wheels are attached so that the machine can be moved to required place in the work yard.so that that work can be done smoothly and quickly as possible.

MATERIALS PLACING IN THEIR REQUIRED POSITIONS:

The angular die frame with dies should be fitted inside the main frame, in such a way that it should slide with the main frame up and down whenever it is required.

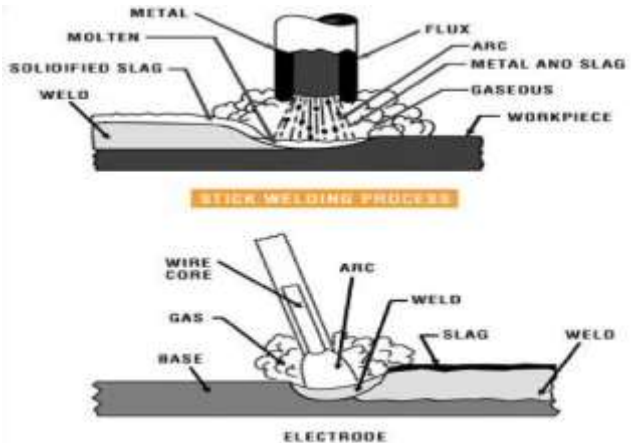
ROPE FITTING:

A rod should be mounted over the frame fitted with bearings on both sides of the rod to the main frame, and the wire rope is fitted to the iron rod in such a way that it can wounded on the iron rod both in clock-wise and anti-clockwise. So that we can make the upward and downward movement of the base die when it is required.

WELDING:

It is a process of joining two metal pieces by melting the edges by an electric arc. The electric arc is produced between two conductors. The electrode is one conductor and the work piece is another conductor. The electrode and the work piece are brought nearer with small air gap.

When current is passed an electric arc is produced between the electrode and the work piece. The work piece and the electrode are melted by the arc. Both molten piece of metal become one. Temperature of arc is about 4000°c Electrodes used in arc welding are coated with a flux. This flux produces a gaseous shield around the molten metal. It prevents the reaction of the molten metal with oxygen and nitrogen in the atmosphere. The flux removes the impurities from the molten metal and form a slag. This slag gets deposited over the weld metal. This protects the weld seam from rapid cooling.



In this project the working principle is as simple as the general phenomenon initially the angular die frame should be aligned collinearly with the ground the grease should be applied to the die walls effectively the prepared wet clay should be powered into the die frame , after filling the dies ramming should be done with human effort and then the excess clay presented over the die frame should be removed with strip, after that the angular die frame should be lifted to a certain height with the help of rope and lever mechanism.

After lifting the angular die frame the setup should be pulled in any required direction again the die frame is placed on the ground and the same procedure is carried out for the production of next batch by using this type of equipment we can produce more productivity with with less effort and in specified time

IV.COST ESTIMATION

S.NO	NAME OF THE COMPONENT	QTY	SPECIFICATIONS	COST OR PRICE
1	ZINC SHEET	1	16 GUAGE 8*4 FEET 38 KGS	RS.2700/
2	IRON RODS	4	12 FEETS LENGTH 32 KGS	RS.2300/
3	IRON WHEELS	4	150 DAIMETER IRON MATERIAL	RS.500/-
4	WIRE ROPE	1	2M LENGTH 5MM DIA	RS.250/-
5	EYE BOLT WITH NUT	1	10MM DIA SIZE EYE BOLT	RS.50/-
6	BEARINGS	2	IRON MATERIAL	RS.400/-
7	WHASHERS	15	10MM DIA	RS.50/-
8	LABOUR			RS.4000/
9	TOTAL COST			RS.10225/-

The total cost of the project including the labour cost=RS.10225/-

ADVANTAGES

- This was a very manual operation, but quite fascinating.
- By adopting this equipment, we can reduce the labour effort and simultaneously reduce the workers.
- Increase the productivity
- Reduce drudgery in the process.
- It does not require any electricity.
- It eliminating the requirement of continuous sitting in awkward position.

Social advantage of the machine is that due to its design, more labour cannot be involved.

LIMITATIONS

1. Initial cost of the machine is high.
2. It require graze at every time

V. CONCLUSIONS

A mechanization of brick/block making machine was designed in accordance with the standard design calculations and it was then constructed using simple fabrication processes. Thereafter, the machine was used to produce affordable and quality bricks and blocks in line with the Indian Standard. The self-aligning characteristic of bricks making machine eases bricklaying, encourage the use of less killed manpower and realizing higher productivity. Apart from savings of material, technology saves time due to higher productivity resulting in an ultimate cost saving of around 50%.

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