

Computer Aided Design and Layout of Logo Debossing Machine Concept for AAC Blocks

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ABSTRACT:AAC Blocks are the substantial masonry units in construction, due to their preeminent properties. AAC Block is a mixture of cement, fly ash, sand, water, and aluminium powder. Aluminium powder will react with the calcium hydroxide and water to form H₂. The hydrogen gas during curing process turns the mixture into foam therefore the volume of the raw mix creating gas bubbles will double, the hydrogen escapes into the atmosphere and is replaced by air. When the air is removed from the material, it is semi solid state. It is then cut into blocks and placed in cylindrical chamber known as Autoclave, for 11-12 hours. During this process of manufacturing of AAC Blocks, there is nowhere provision made for printing the company logo on the Blocks produced so far. In the present work a Logo Debossing Machine is designed to print company logo on the AAC Blocks, providing the company for better product identification, proper branding and marketing of their AAC Blocks. This machine is designed based on the mechanical concepts that print the company logo or name by Debossing on the AAC Blocks.

The machine is capable of debossing logo on 36 standard sized blocks (100 x 200 x 600) for every revolution of the roller. Therefore it can be hereby concluded that design of this Logo Debossing Machine, provides the AAC Blocks manufacturers to print their company name or logo in a very cost effective method. As the selected debossing method has a simplest mechanism and very less machine components, thereby reduced maintenance cost.

KEYWORDS:Logo Printing, Logo Debossing Machine, AAC Blocks.

I. INTRODUCTION

The invention of fired brick in 3500BC was the great breakthrough in the bricks history, from this moment the bricks were made without the heat of sun and could be made even in cooler climates. Those days Romans used white and red clay to manufacture bricks and they mostly preferred to

manufacture their bricks in spring and they stored them for about two years before using or selling. The Romans were first to produce the fired bricks using mobile kilns with a stamp mark of legion who supervised the production of brick and succeed in introducing to the entire country. These kiln fired bricks differed in size and shape compared to the ancient bricks, they were round, oblong, triangular, square, rectangular with a size of 1pes or 2pes (Roman foot) which is about 30.4919cm, and sometimes up to 3pes the larger ones. They built forts, arches, vaults, cultural centre, walls and faces of their aqueducts. The baths of Caracalla and Herculaneum gate of Pompeii in the Rome are the examples of olden Roman brick structures. In the Medieval times, to make the bricks the clay was often kneaded by workers with their bare feet and it was shaped by pushing into the wooden frame covered with sand or straw to prevent from sticking then the excess clay was wiped off by a stick and the frame was removed. In England the art of brick making was advanced by the time of Henry VIII, after the great fire of London in 1666, to rebuild the city mainly bricks were used. Bricks were made by hand until 1855. Then the industrial revolution broke out and the new brick making machine was introduced. Handmade brick production ranged up to 36000 bricks per week, by 1925 a Machine made 12000 bricks a day. To make the brick structures could be much quicker and cheaper, this replaced the materials like stone and rock. During the 19th century, more than 10 billion bricks were produced annually. The bricks were made with soft-mud process from the mid-1800s to early 1900s, by the following process; preparation of ingredient, moulding, drying the bricks and burning the bricks. In India the types of bricks used for construction purpose are as follows:

1. Sun dried bricks
2. Burnt clay bricks
 - a. First class bricks: consists of all the quality of good bricks.
 - b. Second class bricks: moderate quality.

- c. Third class bricks: poor quality.
- d. Fourth class bricks: over burnt, irregular shaped.
3. Fly Ash bricks
4. Concrete bricks
5. Engineering bricks
6. Calcium Silicate bricks
7. Porotherm smart bricks or Eco bricks
8. Autoclaved aerated concreted (AAC)

II. LOGO DEBOSSING ON AAC BLOCKS

A graphic design, symbol, stylish name or an emblem that is used to represent a company, identify a product or a brand is known as a Logo. Logos are the integral part for the identity of company's brand. A quick recognized and widely spread logo intangible property for the company. Logo exists from thousands of years ago which were simple symbols and letters which was created to identify the manufacturer of the product.



Fig.: Logo Printed on different products

When we print a logon on any object, we can reach people at higher level. Methods of printing a logo differ from product to product like stationery, clothing, packages and other industrial products. There are 12 basic methods to print a logo on different types of products:

1. **Silk Screen Printing:** Stencil of the logo is made on a silk screen so that only the ink can pass through that stenciled design. The ink is forced through the stenciled silk screen, therefore printing the logo on the product. This method of printing is used for toys, bags, clothes, umbrella, wooden products, etc..
2. **Pad Printing:** This method is also known as "Ink pick-up and transfer". A silicone pad is used in this pad printing method. This pad picks up the ink from etched logo design and stamps on the desired product. In this method we can print the logo on curved and uneven surfaces and edges.
3. **Heat Transfer Printing:** This method of printing is also called as "Sublimation

Printing", this method use a computer to layout the logo design. Than the logo is printed on transparent film, this film is then heat pressed on the product. This printing gives more glossy and bright colored prints which are ideal for ceramics, fabrics, plastics, glasses and rubber products.

4. **Embroidery:** In this method of printing the embroidery machine is used to print the logo. Embroidery is widely done on textiles, which can print various designs of many different colours on any type of cloth.
5. **Jacquard Knitted:** In this method of printing the logo design is entered into the Jacquard Machine, and then the machine will automatically knit the cloth according to the design in machine.
6. **UV Printing:** This method is also known as "Digital Printing". The photo-sensitizer and UV light is used in this printing method which can print on all kinds of products like cardboard, plywood, plastic and metal products.
7. **Laser Engraving:** In this method the laser light is used to engrave the desired logo design on the product surface.

There are two different types of laser engraving:

- a. **Cold Laser:** This is used on metallic products. It engraves by indenting on the metal surface.
- b. **Hot Laser:** This is used on non-metallic products. It engraves by lightly burning the products' surface when the laser beam is focused on the surface. Laser engraving is done on many products like key chains, wooden surfaces, plastic, glass, leather and cloth.
8. **Offset Printing:** In this method of printing the design on the paper is printed by transferring the paper through the rollers. Two rollers on the top supply the ink to cylinder which then transfers the design onto the offset roller cylinder, then the impression roller cylinder will print on the paper continuously. This printer can print up to 100 papers in 2 minutes
9. **Label Printing:** labeling on any type of product is the easiest way to stick a logo on the product. This is used in sticking barcodes, labeling on glass, wooden products, and metal product. Stickers or labels are easy to remove and they fall after some time therefore it can be used on fast selling goods such as food products, beverages, etc..
10. **Crystal Epoxy Label Printing:** This method is similar to the label printing, the label is printed first and then AB Glue is added on it which becomes solid and gives 3D effect to the label. These types of epoxy label are used in toys, crafts, key-chains, jewelry, identification cards

and dress materials.

11. **Hot Stamp Printing:** In this method of printing the logo mold is heated and pressed on the product. This is widely used on leather items like bags, belts, wallets, hand bands, etc..
12. **Emboss and Deboss printing:** in this method the logo is made by embossing or debossing. The logo is impressed or depressed on the product by using male-female dies or push letters on the surface of the product which creates a 3D effect.

We see that there are different methods of printing for different products; therefore selection of printing method is a factor to be considered. Based on the AAC curing process, we had a possibility of printing a logo at two stages; one is after the horizontal cutting of green cake that is in semi-solid state and another is after autoclave curing at solid state.

In the solid state since we cannot indent on the surface of the blocks, therefore the labeling or pasting method can be adopted. But by labeling on the AAC Blocks it would not last long as the labels may fall. Also by pasting on the AAC blocks we can observe on other products that the pasted logos fade away after some time period.

In the semi-solid state the only method that can be adopted is by penetrating /indenting a logo on the surface of the green cake to get the logo printed permanently. Under the penetration method of logo printing there are two available methods, suitable for printing a logo on the semi-solid surface of the green cake, those are embossing and debossing.

The embossed logo protrudes out onto the side surface of green cake, whereas the debossed logo indent into the side surface of the green cake. In the embossed logo as the logo is protruded out there is a chance of logo getting damaged i.e. the edges of logo may break. Hence, debossing the logo into the surface would be best suitable for printing. Therefore the debossing method of printing a logo is selected.

III. LOGO DEBOSSING MACHINE CONCEPT

In this concept, the machine can be placed either side of the green cake which prints the logo one side by debossing on the side surface of the green cake. As the green cake passes through the horizontal cutters then the wagon carries the green

cake forward to cut vertically. This logo debossing machine can be placed between these two cutters. As the cake passes through the horizontal cutter, this machine's roller rolls over the side surface of the cake thereby debossing the logo on the surface of the cake.

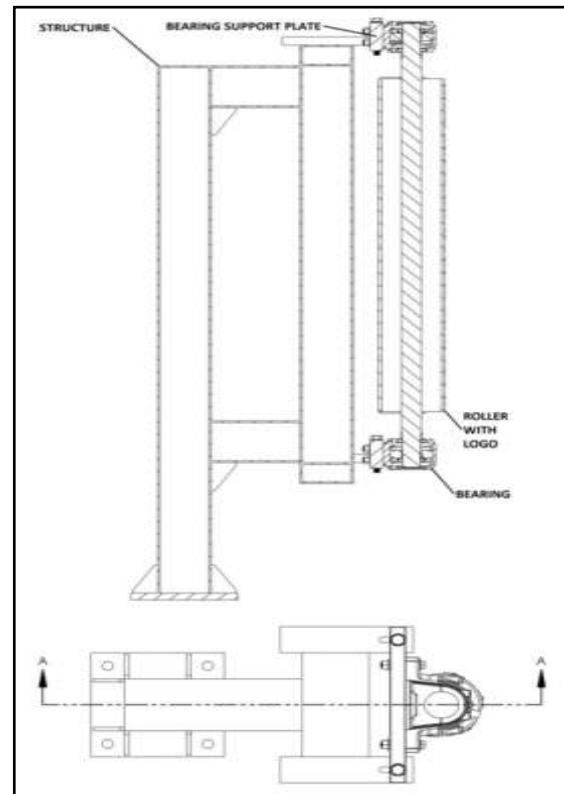


Fig.: Logo Debossing Machine for AAC Blocks

IV. LOGO DEBOSSING MACHINE LAYOUT

The Logo Debossing Machine is the machine which is used to print the logos on the AAC Blocks. The logo is printed by debossing on the surface of the cured cake which is in semi-solid state which is easy to penetrate on the surface of the cake. The logo patch made up of silicon material is pasted on the roller of the machine therefore, as the cake passes through the machine, the roller starts rolling over the surface of the cake. Due to the protruded surface of the logo on the roller, when the roller rolls it indents the surface thereby giving a debossed logo with 3D effect.

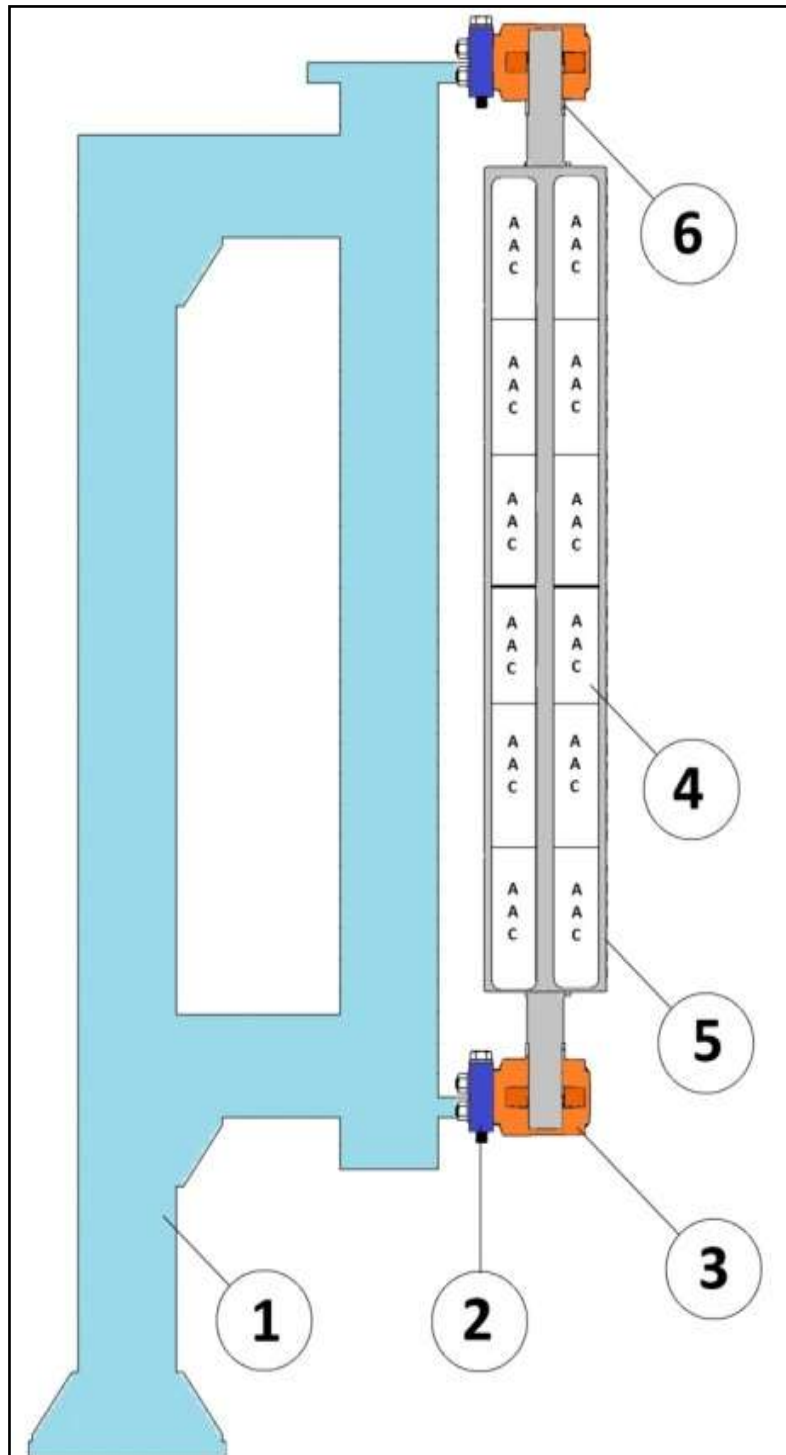


Fig.: Logo Debossing Machine Layout

This machine is developed by using simple mechanism there by using minimum parts and simple operation. This machine consists of the following parts listed below:

1. Structure
2. Bearing Support Plate

3. Bearing
4. Stamp
5. Roller
6. Bush

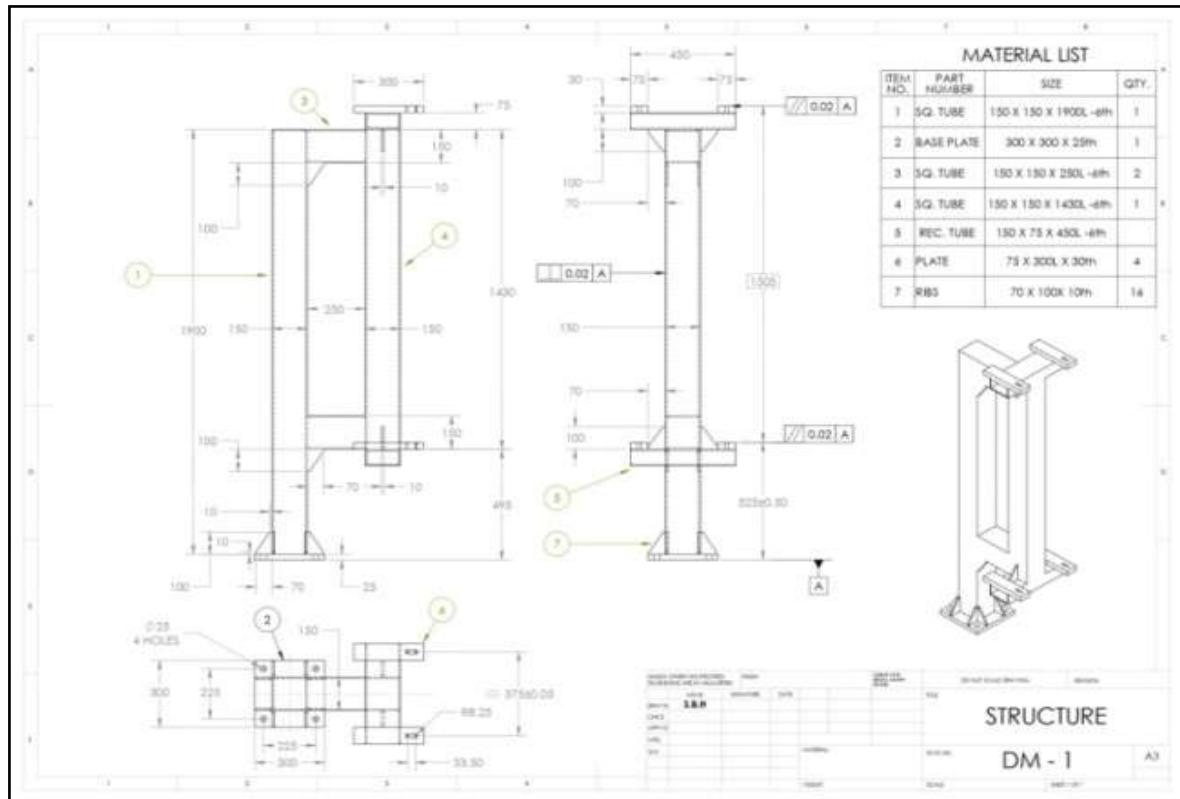


Fig.: Structure

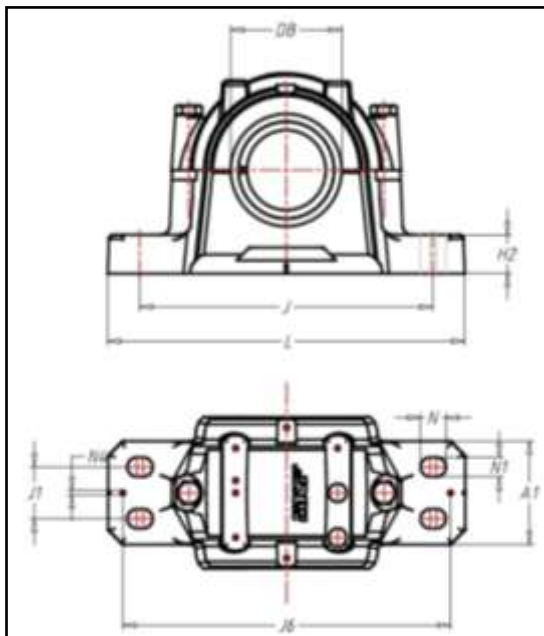


Fig. a: Bearing Technical Drawing

| | |
|---|-------------------------------|
| Designation | FSNL 513-611 + 1311 K + H 311 |
| Seal | TSN 611 C |
| End cover | ASNH 513-611 |
| Designation bearing | 1311 K |
| | BJ1 001 |
| L - Housing width 2 | 0.25 (mm) |
| da - Shaft diameter | 50 (mm) |
| Ca - Inside space length | 51 (mm) |
| Da - Spherical seat diameter | 120 (mm) |
| Db - Seal groove diameter | 77 (mm) |
| A - Base width | 110 (mm) |
| A1 - Flange width | 80 (mm) |
| H - Complete housing height | 149 (mm) |
| H1 - Spherical seat centre height | 80 (mm) |
| H2 - Foot height | 30 (mm) |
| J - Distance between attachment bolts | 230 (mm) |
| J1 - Distance between attachment bolts | 40 (mm) |
| L - Housing width 2 | 275 (mm) |
| N - Length of attachment bolt hole (radial) | 20 (mm) |
| N1 - Width of attachment bolt hole (axial) | 15 (mm) |
| J6 - Distance between dowel pins | 252 (mm) |
| N4 max. - Diameter of dowel pins | 8 (mm) |
| | 6 |
| | 5 |
| | 30 |

Fig. b: Bearing Technical Data

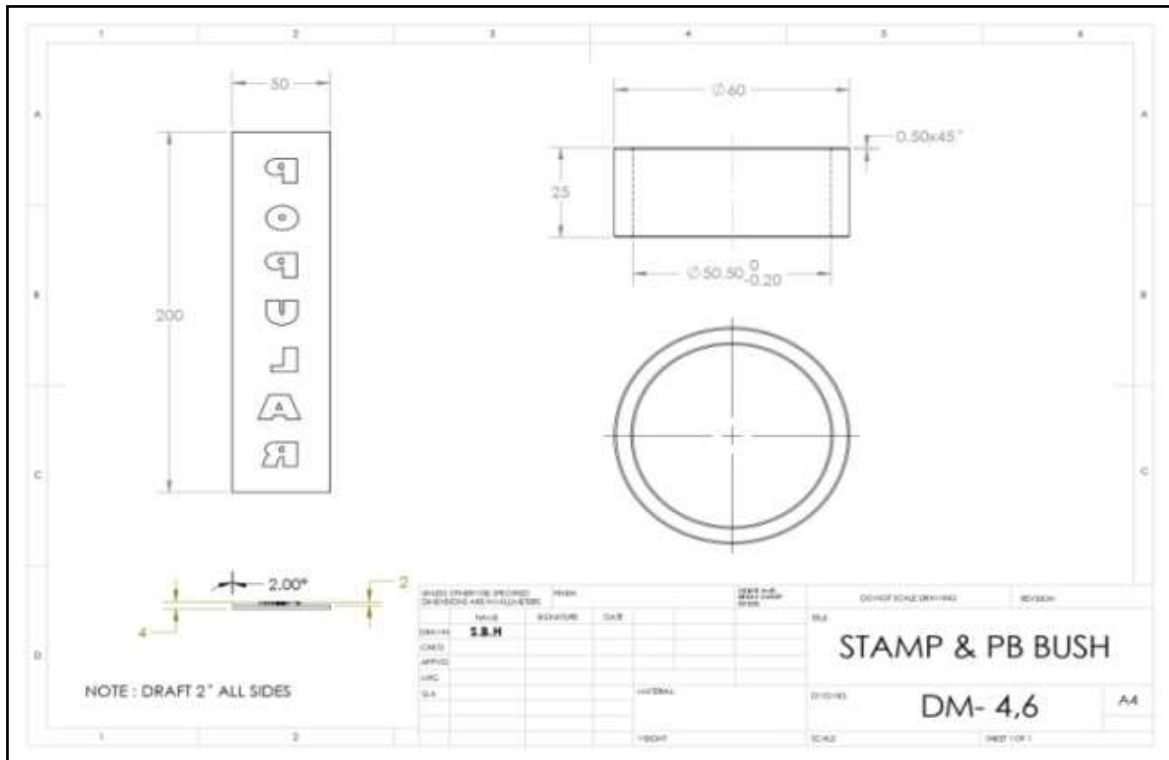


Fig.: Stamp & Bush

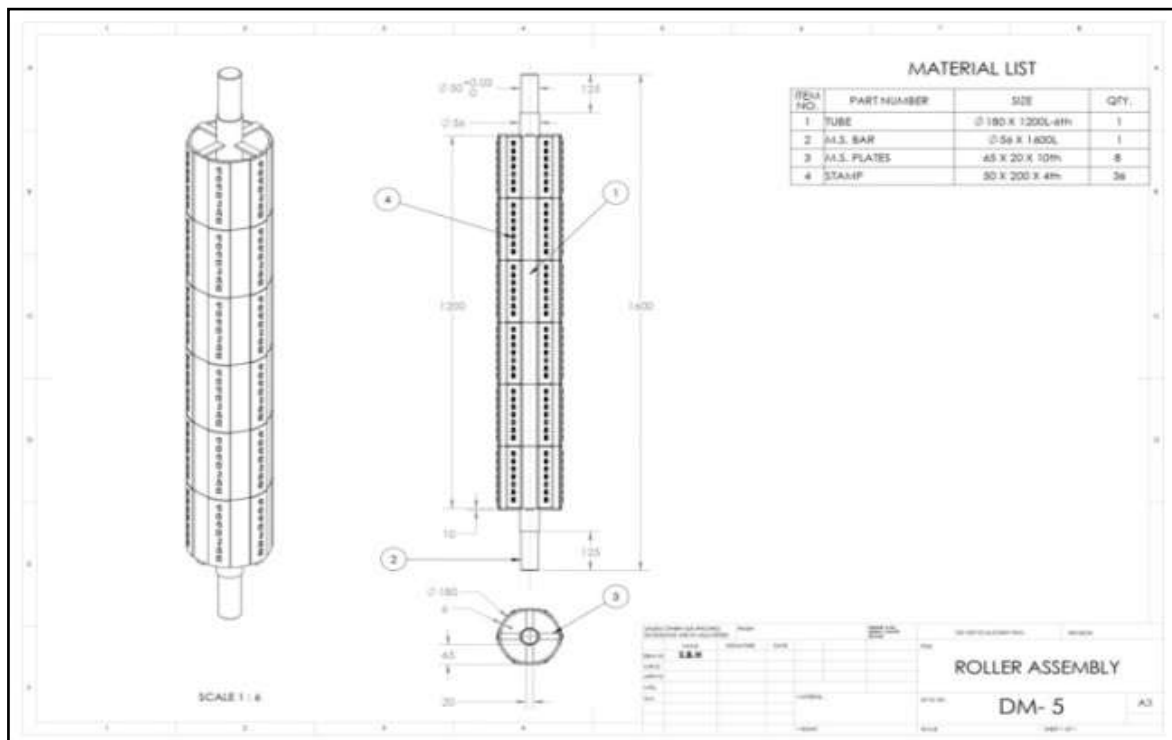


Fig.: Roller

V. COMPUTER AIDED DESIGN OF LOGO DEBOSSING MACHINE

Structure:

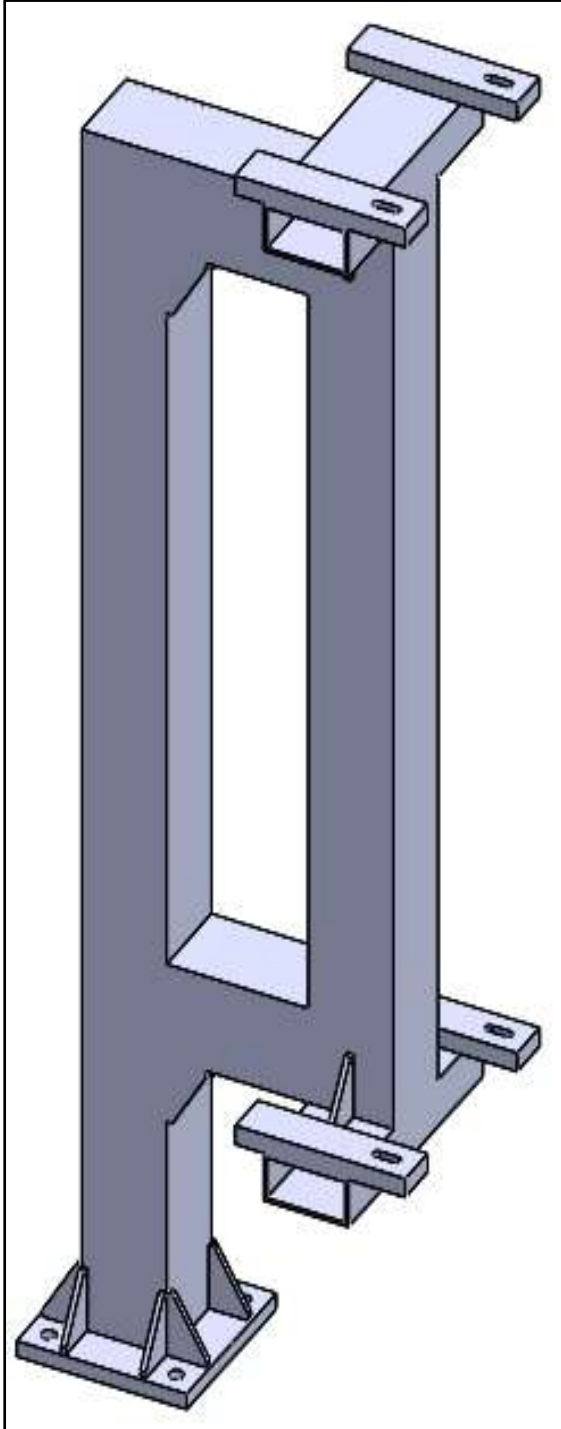


Fig.: Structure 3D View

Bearing Support:

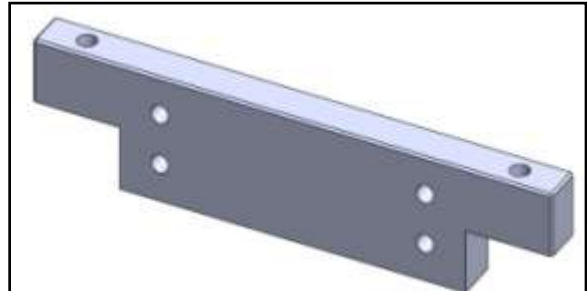


Fig.: Bearing Support 3D View

Bearing:



Fig.: Bearing 3D View

Stamp:

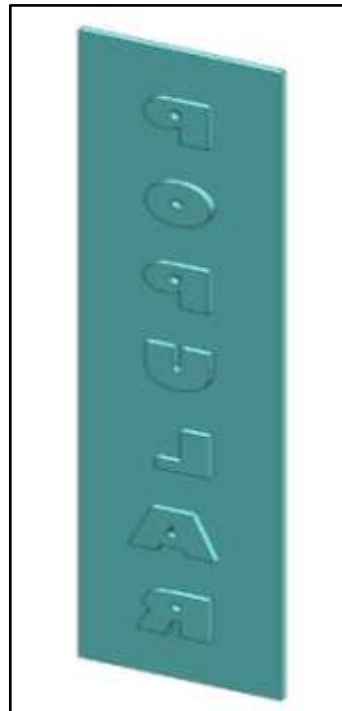


Fig.: Stamp 3D View

Roller:

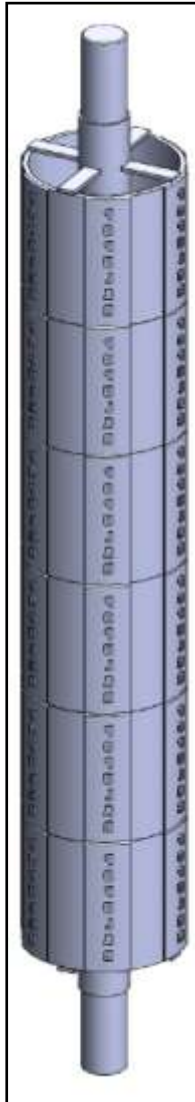


Fig.: Roller 3D View

Bush:

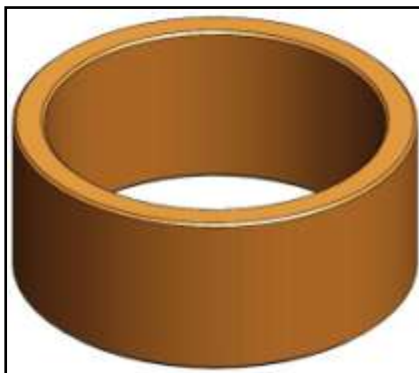


Fig.: Bush 3D View

Assembly:

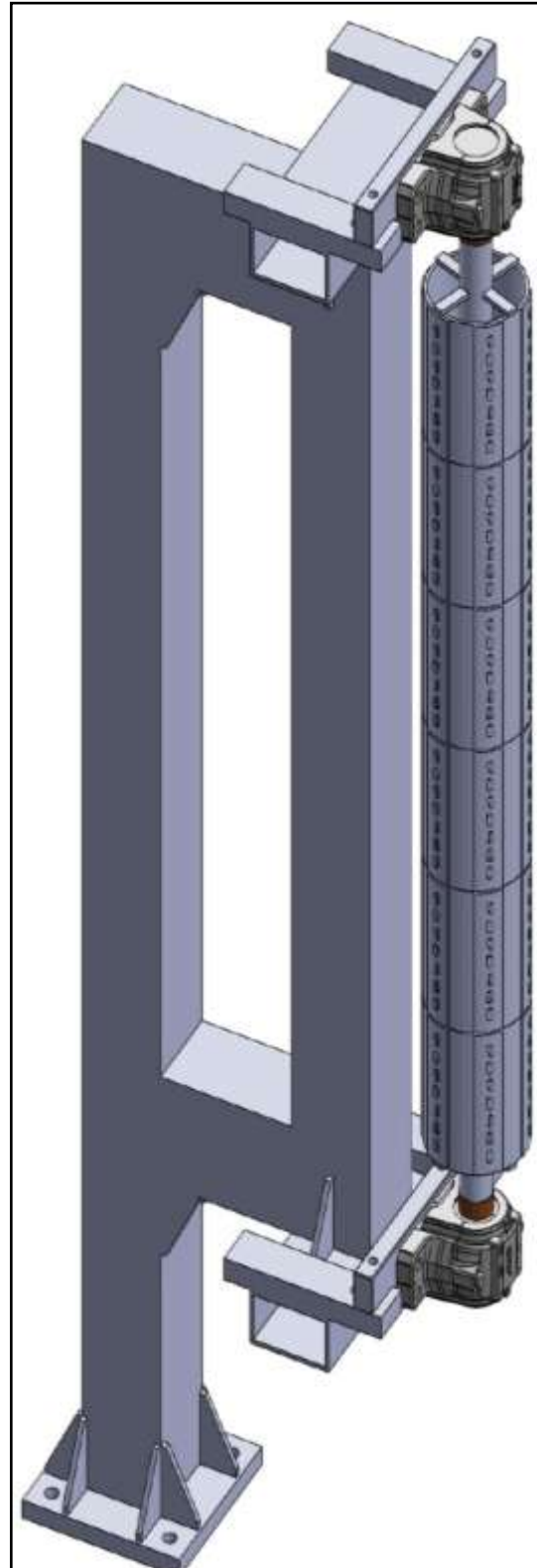


Fig.: LDM Assembly 3D View

Exploded View:

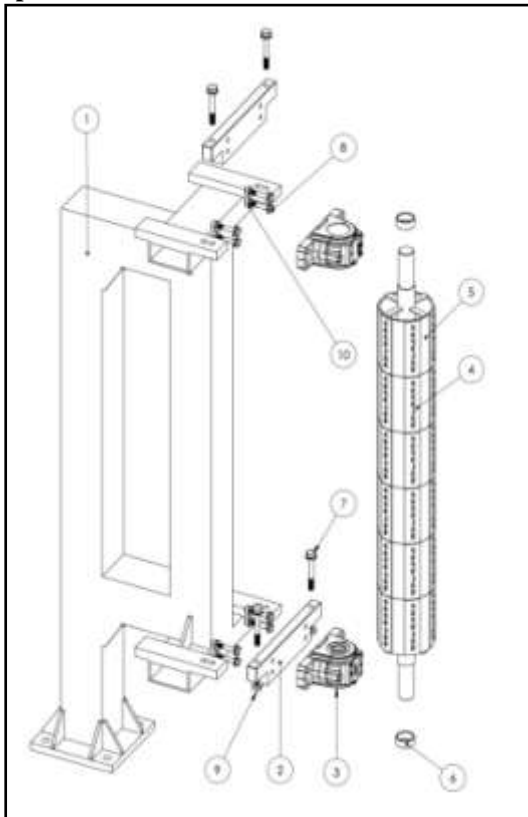


Fig.: LDM Exploded View

Table: LDM parts list

| COMPONENTS / PARTS LIST | | | |
|-------------------------|-----------------------|-------------------------------|------|
| Sl. no. | Item name | Description | Qty. |
| 1 | Structure | | 1 |
| 2 | Bearing support plate | IS2062 | 2 |
| 3 | Bearing | FSNL 513-611 + 1311 K + H 311 | 2 |
| 4 | Stamp | Silicone Polymer | 36 |
| 5 | Roller | | 1 |
| 6 | Bush | PB | 2 |
| 7 | Bolt | M16 x 120L | 4 |
| 8 | Bolt | M14 x 90L | 8 |
| 9 | Nut with washer | M16 | 4 |
| 10 | Nut with washer | M14 | 8 |

1. **Structure:** A structure is a frame work that provides mechanical support for all types of components of a machine. A structure is mostly

built using standard beams, either by welding together or riveting or by bolting. For this machine we have use standard square beams as a primary support, as it has a greater section modulus compared to other section of beams therefore providing more bending strength for the structure that supports the machine. The frame of the structure is made in F-Shape; the base of the structure is welded with the base plate for foundation, which will be bolted by the foundation bolts.

2. **Bearing Support Plate:** The Bearing Support plate is the plate used to fix the bearing assembly. This plate is bolted on the ends of the horizontal beam of the structure as shown in the figure: 4.7, this plate is made adjustable by providing slots on the structure so that the gap between the roller and cake can be maintained.

3. **Bearing:** The Bearing is a very essential part of any machine having motion into it. The bearing reduces friction between two relatively moving parts. The bearing can also transfer load axially in the form of thrust or radially. The bearing mainly consists of three components into it, a ball or a roller placed between the raceway of two outer and inner rings and a cage. There are various types of bearings like Ball Bearing, Roller Bearing, Ball Thrust Bearing, Roller Thrust Bearing, Tapered Roller Bearing and Magnetic Bearings.

In this machine we have used a standard SKF Bearing (FSNL 513-611+1311K+H311) with a Plummer Block Housing, standard seal and adapter sleeves. This is a self-aligning bearing which is best suitable for steeped or plain shafts and can be fitted at any position on the shaft. The Bearings in this machine are fitted on the bearing support plate by bolting.

4. **Stamp:** The stamps in this machine are fixed on the surface of the roller as shown in the figure 4.8. The stamps fixed to the roller rotate as the roller rotates, when the roller come in contact with the Cake. Thereby indenting the surface of the cake and creating logo of debossed effect.

5. **Roller:** The Roller in this machine is supported vertically between two bearings thereby providing free rotation to the roller. After the cake passes through the horizontal cutter the cake surface come in contact with the circumferential surface of the roller. Due to this contact the roller that is free to rotate radially starts rotating.

6. **Bush:** A bush is a fixing unit between the two moving parts of the machine, it a replaceable or fixed metal cylinder of different types of material like Phosphor Bronze, Gun Metal and

Graphite Filled Bronze Casing. In this machine the Phosphor Bronze Bush is used and it is placed between the roller centre shaft and bearing.

VI. RESULT & DISCUSSION

An attempt is made develop a computer aided model and assembly of parts to deboss the logo on AAC blocks. Based on the rolling methodology of printing a logo, two concepts were developed as shown in fig. 2.1 and fig. 2.2. In the concept selection criteria, considering various factors of production (table 2.3) the concept has been selected as it was more economical, minimum maintenance and simplest mechanism adopted. All the parts of the LDM were created and a successful assembly of these parts was done. Thereafter one of the “AAC Block Manufacturer in Belagavi” adopted this concept of printing a logo on AAC Blocks in there company and the following result was found.



Fig.: Comparison between AAC Block with and without logo

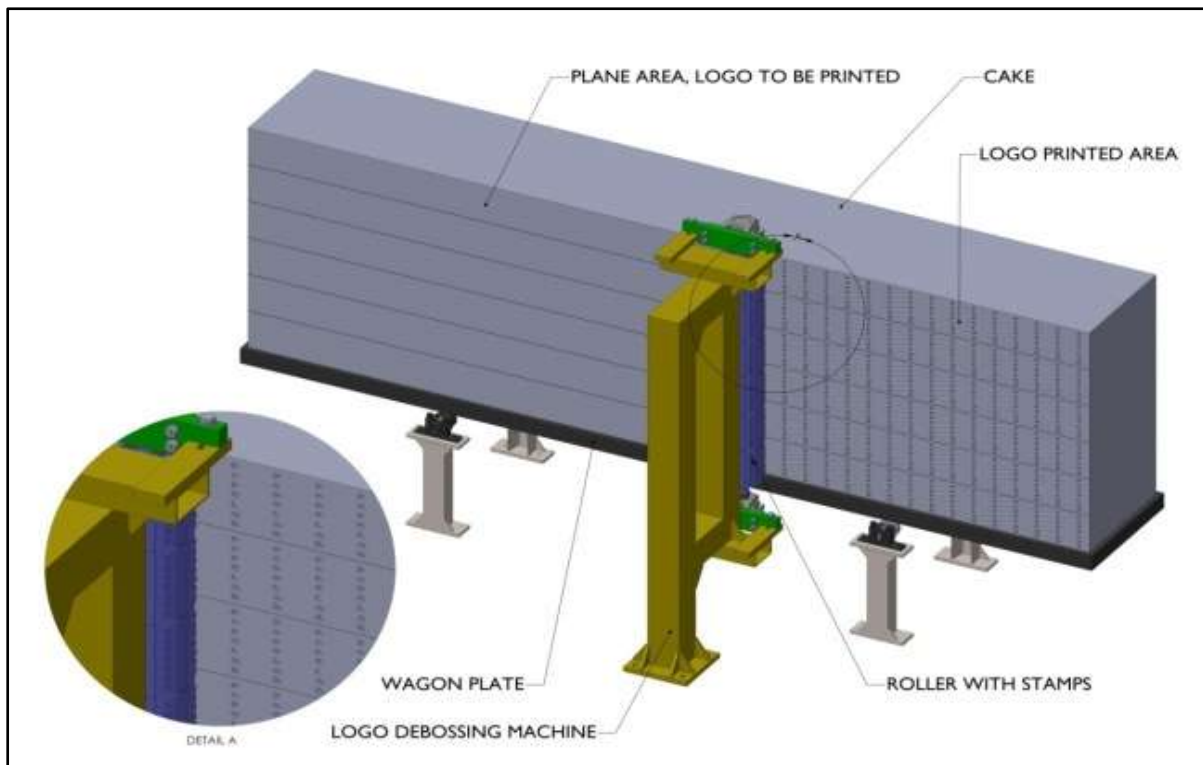


Fig.: Logo Debossing Machine on AAC Green Cake

VII. CONCLUSION & FUTURE SCOPE

Conclusion:

In the present work a Logo Debossing Machine is designed to print company logo on the AAC Blocks, providing the company to make their product identification, proper branding and marketing of their AAC Blocks. This machine is designed based on the mechanical concepts that print the company logo or name by Debossing on the AAC Blocks.

The designed concept of Debossing Machine deboss the company logo or name on AAC Blocks by rolling over the sides of green cake after they pass through horizontal cutter.

The green cake which is in semi-solid state after Curing Process, it is passed through the horizontal and vertical cutter to cut them into the standard sizes. This semi solid state of the green cake facilitates to deboss the Logo on them with ease, as the surface of the green cake is easily penetrable. The machine is capable of debossing logo on 36 standard sized blocks (600 x 100 x 200) for every revolution of the roller.

It can be hereby concluded that design of this Logo Debossing Machine makes the AAC Blocks manufacturers to print their company name or logo in a very cost effective method as the selected debossing method has a simplest mechanism and very less machine components thereby reduced maintenance cost.

Future Scope:

The concept of the present machine is selected and designed based suggestion and requirements of the AAC Blocks manufacturing company in Belagavi. By discussing and understanding their minimum requirements for printing the logo of their company on the AAC Blocks. This machine is capable of debossing company's logo on every block in the cake. But these logos to be printed are not positioned and cannot be printed if the different sizes of blocks are to be cut in the same cake. Therefore the present machine can be developed to print logo on different block sizes in the same cake and positioning the logo to be printed on the block.

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