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Automated Pressing Machine

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Abstract: ***The paper presents the development of a automatic operated compress which encompasses the design, fabrication and performance evaluation of the press. The components parts of the machine were designed using various design equations. The design results were used to select materials for various components. The detailed drawing of the developed machine was done using solid works software. In fabricating the machine, mild steel was used as the locally sourced material. The use of mild steel is due to the fact that its strength, rigidity and machinability falls within the design specifications. Some components of the machine developed include; the frame, working bed, and buttons (on / off). Some of the bought out parts include: ram assembly, rotaey motor, pressure indicator. Here the automation of a pressing machine using electric rotary motor. Generally, the manual operation of the pressing machine is automated. The main objective is to reduce man power, cost, production time and to increase the quantity and quality of production. The existing system of pressing process are manual controlling of pressing and unloading and the chance of human errors and production time are more. In order to overcome these errors, we have designed this electric rotary machine pressing . The automatic press machines that are incorporated with a electric rotary motor are made for heavy-duty pressing operations. In a heavy-duty pressing operation, the production is bulky and precision is required.***

I. INTRODUCTION

Automation plays a major role in all fields, especially in the production field. In earlier days more number of persons was involved in production field. To reduce the time consumption and men power, the automation came into play.

In general industrial manufacturing, a press machine is used to exert high pressure onto or against the workpieces or the manufactured parts to change the materials into a desired shape or form. The pressing process is mostly done for nonmetal and metal also materials since the malleability of metal allows the materials to withstand the pressure without breaking apart.

In engineering, the pressing operations are conducted with automatic press machines which are usually hydraulically powered or mechanically powered. The automatic press machines that are incorporated with electric rotary motor are made for heavy-duty pressing operations. In a heavy-duty pressing operation, the production is bulky and precision is required.

A press machine, either the automatic press machine or the manual press machine, is also known as a forming press that is used in the modern manufacturing industry to deform a workpiece. This type of machine comes in with numerous styles and configurations, yet the anatomy of the press machines is similar.

II. LITERATURE REVIEW

This section highlights on reviews related to study and research such as journals, case studies, books, technical documents, and internet sources, that has been selected relavent to this project . firstly, an overview of design and development of new product which is, includes the product specification and requirement, concept selection, and various types of prototypes. Then, material used in press machine show the variety of materials often used.

Using the optimum resources possible in designing the Automated press components can effect reduction in the cost by optimizing the weight of material utilized for building the structure. An attempt has been made in this direction to reduce the volume of material, cost of the press and to make is portable.

Today I'd like to discuss Automated presses. Yes I know a broad subject so we are going to take it down to the basics give you a layman's description and give you a little history. After searching the web and showing my findings to my techs the most basic description of a Automated press which is a machine tool and used in the manufacturing industry was found on wiseGeek.com here it.

"A automated press is a mechanical machine used for compressing non-metallic items. The force is generated through the use of motor to increase the power of a standard mechanical level. This type of machine is typically found in a manufacturing environment"

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III. METHODOLOGY

In achieving the aim of his work, component parts of the machine were de-signed using various design equations. The design results were used to select materials for various components The detailed drawing of the developed Automated press machine was done using SOLIDWORKS software. In fabricating the machine, mild steel was used as the locally sourced material. The use of mild steel is due to the fact that its strength, rigidity and machinability falls within the design specifications. It is also available and cost effective.

IV. DESIGN AND ANALYSIS OF SOME COMPONENTS

Some components parts of the machine developed include; the frame (stand, base support, column, top plate), mounting table, working bed, ram assembly, hand lever, pressure indicator.

A. Machine Frame

A frame is a structure on which main units of a machine tool are assembled. For this work, the frame was designed to accommodate ram assembly, hydraulic pump, oil thank, and work ing table (bed). The design consideration is that of direct tension imposed on the pillars. Other frame members are subjected to simple bending stresses.
Dimension of the frame,
Length: 750
Width: 750
Height: 650

1) Material : Mild steel

Mild Steel: It contains 0.05 to 0.3 percent carbons it has for almost all purpose replaced wrought iron, its greater strength giving it under viable advantages. Mild steel can be rolled, wielded and down. It can even be cast, though not very successfully. Among its application are plates for ship building, bicycle frame tubes, mesh work, bolts, nuts, studs etc. solid and hollow constructional sections, sheet metal parts and steel castings such as flywheels and locomotive wheel centers.

B. Design for Bolts

The diameter of bolt was determined from Equation (2) according to Khurmi and Gupta, 2005:

$$P = \frac{\pi}{4}(d_c)^2 \sigma_t n$$

where: P is the external load acting on the cover plate, dc is the core diameter of the bolt thread, σt is the allowable tensile stress for bolt material, n is the number of bolt

$$\text{but} \quad P = \frac{\pi}{4}(D)^2 p$$

C. Determination Of Tensile Stress Due To Stretching Of Bolt

Initial tension in a bolt based on experiments may be found by the relationship in Equation (4) as given by Sumaila and Ibhadode, 2011.

$$P_i = 2840d\,(N)$$

where Pi is the initial tension in a bolt (N), d is the nominal bolt diameter.

D. Determination Of Stress Area On The Bolt

Bolt Stress area on the bolt was found using the relation in Equation (5) as given by Khurmi and Gupta, 2005:

$$\text{Stress Area} = \frac{\pi}{4}\left(\frac{d_{p+d_c}}{2}\right)^2$$

where dp is the pitch diameter, dc is the core or minor diameter.

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V. DETAILED DRAWINGS OF THE MACHINE

The detailed Isometric view and Orthographic view of the machine are shown in Figure 2 respectively.

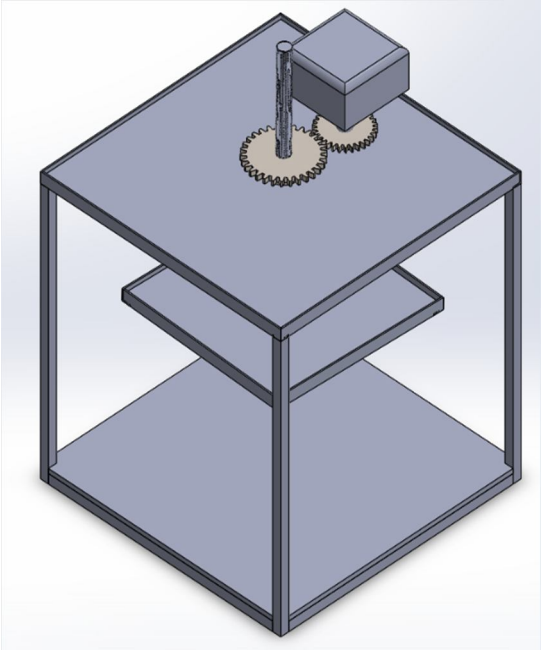


Fig 2.

VI. MACHINE FABRICATION PROCESSES

The various processes used in the fabrication of this hydraulic press machine in-clude: Measurement, Marking out, Cutting, Drilling, Welding, Fastening, Grinding and Painting.

A. Technical Specification

1) Electric Motor, 2 HP
2) With provide Plywood Board
3) Forwarding and Reversing Switch
4) Make of Gears NTN / SKF / NBC
5) With all Standard Accessories Complete

Size (Inches)	Motor (H.P.)	Weight App. (M.T.)	Floor Space (Feet)	Pressing Height (in inches)
45*65	2	0.9	5*55	0” to 48”

B. Assembly and Welding of Machine Components

In welding various components of this machine together, MIG Welding technique was used because of the ease of concentration of heat. Heat spread reduces buckling and warping. The heat concentration also increases the depth of penetration and speeds up the welding operation. The base which is made of mild steel pipes was first set up. The base has a length of 750 mm, breadth of 25 mm and thickness of 04 mm. The column which is made of four pieces of vertical mild steel pipes was welded to the base that has been set up. Each of the pipe has length of 650 mm (vertical height), breadth of 25 mm and thick-ness of 04 mm. They were all welded to the base to form the column of the ma-chine. Having done this, four pieces mild steel angles (length of 750mm, breadth of 25 mm and thickness of 04mm) were welded to the top part of the frame. With all the major frame parts in firm position, the frame stand was welded to the base of the frame to provide for stability of the machine during operations.

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Two holes each of 06 mm in diameter was made on each of the column. This is to give room for adjustment of the bed (table).

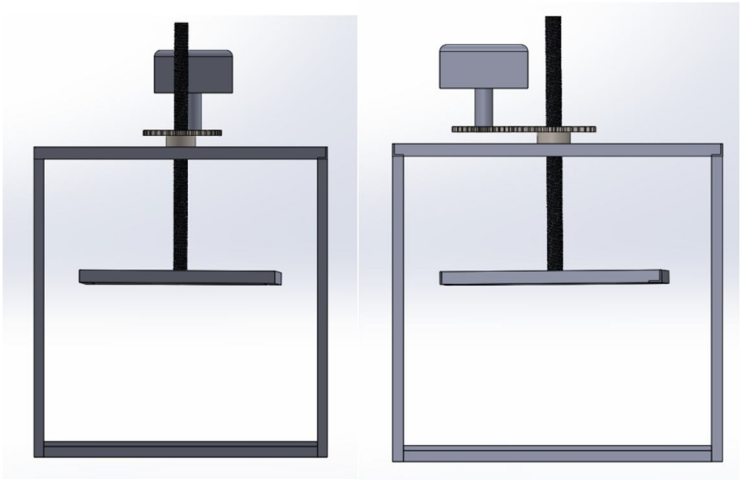


Fig. 2 (FRONT) fig. 2 (RHS)

VII. RESULTS AND DISCUSSION

The developed manually operated hydraulic press was achieved by following the stated objectives of this work. The machine developed was made from locally sourced materials. Mild steel was used in fabricating majority of the components of the machine. One important feature of this press machine is interchange ability of mould and die without dismantling the ram assembly. Prior to machine performance evaluation, machine frame, structural members, weld, rotary motor, rod and gears mechanism were inspected in order to check for any fault or leakages. Tests were carried out on the multipurpose press machine by using it to press different non-metals (materials) at maxi-mum pressure. The motorized press machine developed was used to perform various press works. The machine worked without any challenge as there was no distortion, deformation, no weld failure, no leakages and the operation of rotary motor, ram and gears mechanism was quite satisfactory under the varying loads.

A. Advantages

1) Power accuracy, efficiency and easy maintenance.
2) With the introduction of automation systems, the pressing operation has becomes automated and the efficiency of production is highly improved.
3) Reduced maintenance
4) Easier feeding
5) Fewer errors
6) Wider variety

B. Future

1) Automated pressing machine used for shaped refractory. E.g. Replace friction presses, Solve law, Efficiency, High scrap rate and difficult employment.
2) Also known as a forming press, a is a tool used in the manufacturing industry to deform a non metallic material under high pressure.

VIII. CONCLUSION

A automatic press machine has been developed. The machine was fabricated using locally made materials. The machine is capable of performing various press works. Various machine parts such as motor, hand buttons, ram assembly worked effectively and efficiently. Some of press work operations performed on the machine include: bending, drawing and stamping. Performance evaluation of the machine shows that it can compete favourably with imported press machines of the same designed capacity. The cost of developing the machine locally as at the time of fabrication was Rs. 13000 compared to the cost of purchasing the imported ones of same capacity which ranges from 80,000 to 1,00,000 excluding cost of importation. The development of more of this important workshop machine is expected to boost our local manufacturing industries.

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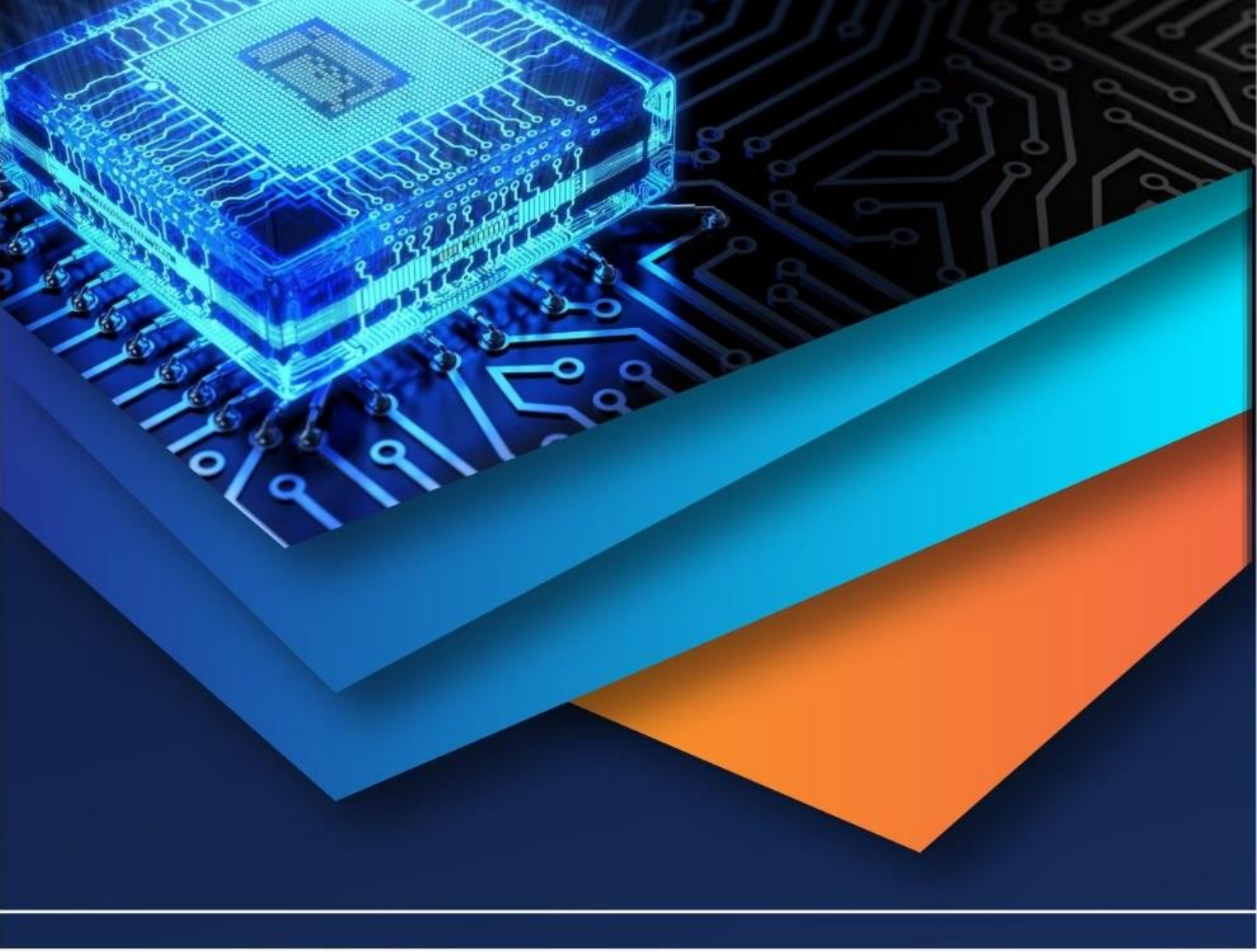
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