

# Design And Fabrication of Pneumatic Paper Cup Making Machine

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**Abstract** - This assignment is primarily based at the layout and assembly of an air-operated paper cup making gadget. essentially this undertaking is to don't forget the modern-day problem of expensive gadget for making computer-controlled paper cups used in the modern industries. paper cups specifically include plastic. Plastic is a very risky substance in nature and in living things. With the help of this mechanical system paper cups are fabricated from paper, and the leaves are also used to make cups. After discovering how the present day system makes paper cups, we came up with an inexpensive answer for generating paper cups and bowls. This size of paper cup making machine is loose to match everywhere and is very cost-efficient as properly.

In this gadget we use simple strategies to enhance the efficiency of our undertaking. Punch making plans and die are used for the actual making of a paper cup. The air cylinder presents air to the actuator through a directional manage valve. Punch is used with the assist of a directional manipulate valve to govern air strain and supply air to the actuator, because of which the punch backs up and presses on the paper. Paper acquires a country of die and the formation of a paper cup happens. This undertaking is very reasonably priced and minimizes the damaging results of plastic use.

**Key Words:** air operated, plastic, fabricated, leaves, inexpensive, efficiency, minimizes

## 1. INTRODUCTION

### 1.1 PROJECT DEFINITION

This project is about design and fabrication of pneumatic paper cup making machine. The pneumatic paper making press is used to produce different shapes of cup in faster production rate. The principle of operation is the same as the conventional simple press. The difference is only in the type of fluid medium and the type of fixtures used and type of drive.

### 1.2 PROJECT OBJECTIVES

A Pneumatic device is constantly better preference than hydraulic machines for the manufacturing of paper cups. It is comparatively more lowin cost for production of huge portions of products as

it makes use of compressed air instead of hydraulic fluid which is high-priced and now not clean to control and store.

The cutting-edge problem is that pc-controlled paper cup making device inside the market are high priced and consequently now not lower priced for a tea vendor stall. The manufacture of this paper cup making gadget is benefits to such dealers. The device size is comfy to in shape everywhere and is easily transportable.

## PROJECT SPECIFICATIONS

The model is about 550 mm high and width is 300 mm. The assembly consist of actuator, punch, die, direction control valve, flow control valve, connectors and hoses. The material used for frame is galvanised iron, for die set is mild steel.

## 2. LITERATURE REVIEW

### 2.1 LITERATURE RELATED TO PROJECT

1. Design and Fabrication of Pneumatically Operated Paper Cup Making Machine

**Author:** Vignesh K, Porkalan S, Pradhap Kumar M, Prasanna Venkatesh S, Packiyaraj M

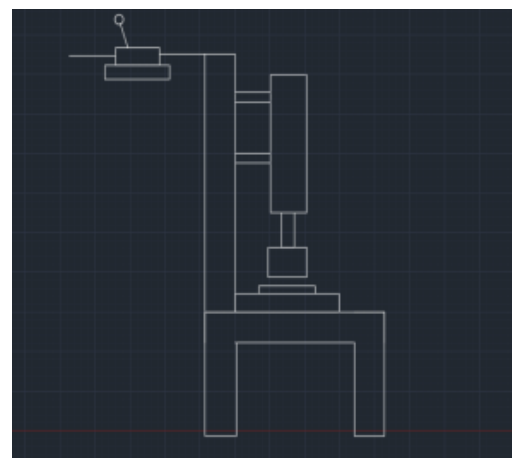


Figure 1. 2D Experimental setup diagram

In this paper they compared Pneumatic system versus hydraulic system and mechanical system in terms of maintenance, cost and accuracy. Their scope of the project was making the cost of the paper cup making machine as low as possible and increasing its efficiency.

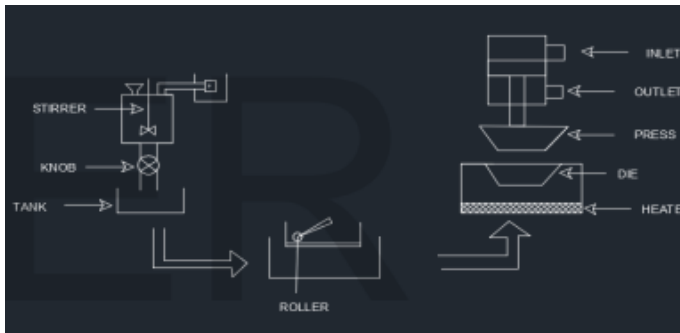
2. Design for manufacture and assembly of a paper cup making machine in a developing nation

**Author:** Kudakwashe N. Masengere, Tawanda Mushiri

This paper is on the layout for manufacture and meeting of a paper cup making machine for a growing financial system which can be regionally synthetic within an earnings and expenditure that fits to maximum small to medium corporations. A deeper know-how of the paper cup making system changed into carried out with the aid of the internet, scholarly journals and commercial visits to local businesses.

3. Fabrication of pneumatically operated paper cup and dish making machine

**Author:** Ashwini Masurkar, Rushikesh Kolape, Sneha More, Yogesh Mane, prof. Dinesh Pargunde



**Figure 2.** 2D Experimental setup diagram

This paper is based totally on the manufacture and assembly of an air-cooled paper cup and a dishwasher. paper cups particularly contain plastics. And plastic is the maximum risky substance inside the surroundings. With the assist of this mechanical machine paper cups are made from any kind of paper and the leaves are also used to make cups. After learning how the modern gadget makes paper cups, we got here up with an inexpensive solution for making paper cups and bowls. This length of paper cup making device is free to healthy anywhere and could be very cost-effective as properly. on this system we use the most primary techniques to improve the performance of our undertaking.

## 2.2 LITERATURE SUMMARY

The pneumatic machine has been located to be very effective, efficient, and coffee cost. And plastic is the

maximum risky substance in the environment. With the assist of this air-conditioning machine, paper cups will be made from any type of paper and leaves. we come up with an inexpensive solution for producing paper cups. This mission will notably keep and decrease the harmful effects from the used plastic. The gadget length may be at ease to fit any length and will be clean to carry.

## 2.3 CALCULATIONS

A. Design of Pneumatic Cylinder 4\*2

Force to be exerted is 80N

Force = pressure × area

Pressure in the cylinder = 0.8 × 0.8 bar.

Area of the piston  $(\pi d^2 / 4) = \text{force} / \text{pressure}$ .

= 80 / 80000

= 0.001m<sup>2</sup> D<sup>2</sup> = (8 × 0.001) / π

Bore diameter (D) = 0.050 = 50mm.

B. For Forward Stroke of 50mm bore diameter cylinder

Corresponding rod diameter = 25mm

Area of the piston =  $(\pi d^2) / 4$ .

=  $(\pi \times 40^2) / 4$ .

= 1256.8mm<sup>2</sup>

Force ( modified ) to be exerted

= pressure × area

= 80000 × 1256.8

= 100N

C. Return Stroke Force cylinder

= pressure ( area of piston – area of piston rod )

= 80000 × (1256.8 – 201) = 84N

For working pressure of 0.4bar Extending force = 100N Retracting force = 84N.

## 3. COMPONENTS INVOLVED

The pneumatic Paper cup making machine consists of the following components to fulfil the requirements to complete operation of the machine.

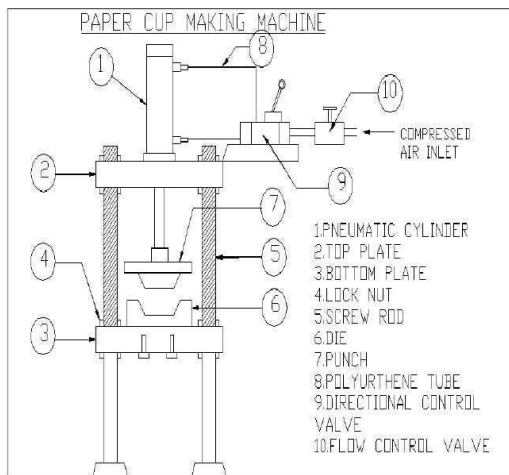


Figure 3. Components of model

**CYLINDER:**

A cylinder is a double cylinder, which means that air pressure operates in a distinct direction (the front and rear). The air from the compressor passes via the strain controller to the desired quantity by using adjusting its waft control valve. A stress gauge gauge is hooked up to the controller to suggest line stress. The compressed air is then exceeded via a directional manipulate valve to offer air one at a time from both aspect of the cylinder input and outlet. the two hoses take the output and enter of the manage valve and are attached to each ends of the cylinder the use of connectors. one of the consequences from the course manipulate valve is transferred to the float manipulate valve.

**CYLINDER TECHNICAL DATA:**

Barrel: It is made of cold drawn aluminium honed to 25mm.

Stroke length: 100mm

Piston Rod: M.S. hard Chrome plated

Seals: Nitrile (Buna - N) Elastomer

Piston: Aluminium

Square body, Double acting cylinder

**DIRECTIONAL CONTROL VALVE : (4\*3)**

To manipulate the movement of the cylinder movement, the air stress have to be managed, controlled and reversed in a predetermined order as and while required within the pneumatic gadget.

in addition, one can also want to manipulate the quantity of strain and flow fee to provide the desired degree of strength and pace of the actuator. to accomplish these responsibilities, stress valves (flow manipulate valve) are used. stress valves components used to manipulate and manipulate the air float place.



Figure 4. Direction control valve

The principle capabilities of the valves are-

- start and forestall the fluid electricity(air)
- manipulate the direction of go with the flow of compressed air
- manage the drift rate of the air
- manage the strain rating of the air

**FLOW CONTROL VALVE:**

these are used to manipulate the flow of air through the valve. A manipulate valve that directs the reception of a particular outside sign, which can be a mechanical, electric or liquid sign signal, adjustments role orientation, or initiates liquid flow to a specific a part of the air circuit. They can be used to perform obligations which include:

1. Controlling the direction of movement of the actuator Cylinder
2. Select other air flow options.
3. To stop and start air flow



Figure 5. Flow control valve

**PUNCH:**

The male part of reducing to demise is referred to as the punch. it is also a removable top limb connected to a piston wall. The layout of the fist depends at the place to be drilled or included, in addition to the stress required to suit the piece of work. The punch technique also relies upon on the vicinity to be punctured or uncovered or pierced. The punch is product of mild metallic.

**DIE:**

The die is mounted on the bottom plate. The die is made in Mild steel.



Figure 6. Paper cup die

**HOSES:**

Hoses used in this pneumatic system are made up of polyurethane and blue in color. These hoses can with stand at a maximum pressure level of 10 kg/cm2. Diameter of hose is 8 mm. length is 1 m.



Figure 7. Pneumatic Hose

**4. MODELS & ASSEMBLY**

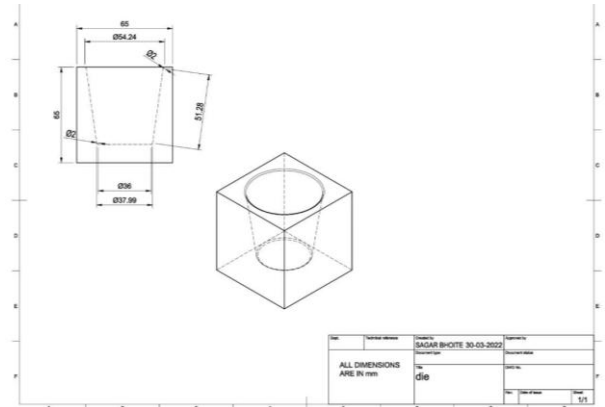


Figure 8. design of cup die

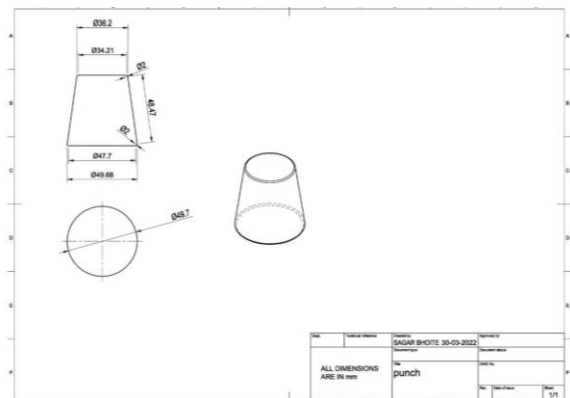


Figure 9. design of cup punch

**5. ASSEMBLY**

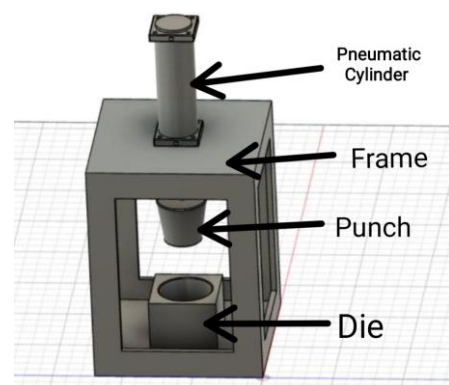


Figure 10. Assembly of model



**Figure 11.** Assembly of model

## 6. WORKING MECHANISM

### 6.1 Concept

This paper cup holder has a dual pneumatic device, which includes a punch, die, top plate, bottom plate, valve control valve, flow control valve, connectors and pipes. The compressor provides high pressure air to the cylinder parts (a and b) whose flow is controlled by a flow control valve.

### 6.2 OPERATION

The air passes thru the course manage valve. this is used to prompt the piston and to determine its path of motion (a or b). The piston is connected to the ram. on the end of the ram's punch is tied. The location of dying in a ram may be modified in one of a kind methods.

The piston, ram and punch are the shifting elements of this gadget. The dye is constant at the bottom of the machine. The complete unit is targeted in a column (frame). whilst air flows to the glide manipulate valve, its extent is confined to the desired distinctive price.

Then the course control valves control the part of the cylinder that should continue to be according with the feed direction. when it takes part A of the cylinder, it movements the ram to the ground with the fist. Fist, fists Paper stored on a dice.

next, directional manipulate valves are activated to permit air to circulate segment B of the cylinder. because of the partial air A is launched from the exhaust valve.

This makes the punch flow upwards. The cup may be eliminated and the subsequent paper may be located over the estate for the following round and accordingly the process can be repeated.

## 6.3 ADVANTAGES

- This product is one of the plastic cups and plates.
- easy to decompose the product.
- reasonably-priced and without difficulty available substances are used.
- herbal product.
- No fire threat trouble due to overload
- immediate response is executed.
- smooth to maintain and restore
- Unit fees are minimum

## 7. METHODOLOGY

We followed a series of steps that will guide us to solve the problems and fulfil the project objectives.

- Firstly we concentrated on designing the dimensions of the various components such as the punch, die and the frame.
- We further analysed the loading conditions required for the manufacturing of paper (leaf) cup using the pneumatic system as the main operating
- We also tried to find out the different ways in which the pneumatic cups are made in todays industry.
- By taking a survey on the internet we found that the cup making industries have equipments which are much more expensive and are not affordable to the small scale industries and thus they are not able to make profit.
- We further took a look at the die manufacturers as well as the frame manufacturers and the pneumatic cylinder supplying dealers.
- We then further collected all the components and we went on towards the assembling of the components.
- We faced many difficulties while assembling, as there were many issues regarding the fittings of the components.
- After facing many difficulties, we finally were able to complete our project successfully with the help of our guide Prof. Mr. Vishwas Palve sir



who was continuously in contact with us and helped us to complete our model in a very short time period which wouldn't be able possible without him.

- Lastly thanks to all the team members for contributing towards a great success.

## 8. CONCLUSION

The scope of the project changed into making the price of the paper cup system as low as feasible and growing its efficiency. This paper cup making system and dishwasher offers the cup necessities approximately 85% performance. it's far clear that the mission is economically possible in all respects, as well as the paper refresh unit.

The pneumatic machine is better than the hydraulic device and mechanical gadget in terms of renovation, cost, protection and accuracy. The device frame is carefully designed and examined when it meets the requirements.

## 9. REFERENCES

- [1] Sanchit Gaikwad, Amol Kalokhe, "automatic paper plate making machine", global magazine for research in Engineering packages, ISSN:2494-9150 , vol 02 , pp.1-5 , (2017).
- [2] (Rose-Hulman ), D.S.(2008). "creation to design for (price effective) meeting and manufacturing". Retrieved 12/01/2017,2017 from <http://me.gatech.edu/files/capstone/L071ME4182DFA>.
- [3] Aurabh rathod, Nitin H Wankhede, "design of manually operated transportable paper recycling gadget", ISSN:2321-8169 , (2016)
- [4] IJSRD - international magazine for clinical studies & improvement| Vol. 6, trouble 02, 2017 | ISSN (online): 2321-0613, Vignesh K1 Porkalan Pradhap Kumar Prasanna Venkatesh Packiyaraj
- [5] Ashwini Masurkar, Rushikesh Kolape, Sneha more, Yogesh Mane, prof. Dinesh Pargunde, global magazine of scientific & Engineering research extent 10, difficulty five, can also-2018 ISSN 2229-5518

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