HYDRAULIC PAPER CUP MAKING MACHINE

T. R. GHOLVE,

Department of Mechanical Engineering, S. B. Patil College of Engineering, Savitribai Phule, Pune University, Pune, India

Y. M. THORAT,

Department of Mechanical Engineering, S. B. Patil College of Engineering, Savitribai Phule, Pune University, Pune, India

A. R. KASHID,

Department of Mechanical Engineering, S. B. Patil College of Engineering, Savitribai Phule, Pune University, Pune, India

A. A. MANE

Department of Mechanical Engineering, S. B. Patil College of Engineering, Savitribai Phule, Pune University, Pune, India

PROF. S. G. KOLIGIRI

Department of Mechanical Engineering, S. B. Patil College of Engineering, Savitribai Phule, Pune University, Pune, India

ABSTRACT:

Generally the cups are made in plastics. The plastics are harmful and it has many disadvantages to us. By naturally we get leaves, papers by using this we can make cups. It is very cheap and it does not have any chemical effects. The paper cup is made by a hydraulic machine. The machine is operated by the hydraulic system and by using this we can produce cup at high production rate. By using different shape die we can produce different shape and size cups. The machine size is comfortable to suit anywhere.

The automatic approach for manufacturing of the cups is found very suitable and also decreases the cost of the manufacturing. The paper cups are also found sustainable for the environment safety.
KEYWORDS: manufacturing of cup, paper cup, hydraulic Cup Making, Machine, etc.

I. INTRODUCTION:

In using hydraulic machine the demand for paper cups is increasing continuously.To satisfy the demand, current productivity also should be increased. The hydraulic paper cup making machine is used to different shapes of cup in faster production rate. The difference is only in the type of drive and the type of fixtures used.
The reasons behind using this press type are as follows:

➤ Hydraulic paper making press reduces the manual work.
➤ This type of machine reduces working time.
➤ The paper cup-making machine is a simple pedal operated machine, which is manually operated with minimum power consumption.
➤ 300 watts of power is needed for the heating units and can be worked on the domestic line (220 volts).

➤ The machine can be located in any village/towns where electricity and leaves of banana, beautia, bauhinia and arecanut palm sheaths are available in plenty.
➤ The paper cups/plates manufactured in the unit is hygienically superior.

Now the project mainly concentrates on designing a suitable operating system. To maintain simplicity and economy in the design the locally fabricated unit has been used. Our project achieves higher safety, reduces human effort, increases the efficiency, reduces the work load, reduces the fatigue of workers and reduces maintenance cost.

II. LITERATURE REVIEW:

Sanchit Gaikwad and Amol Kalokhe have proposed the methods for improvement of the food services for improving public health. The paper plates have found very suitable for use and are environment friendly. The plates have been very popular over the years. The plastic plates were wasted after use and it does not decomposed very easily. The effects of the plastic plates on human health were avoided by these paper plates. The manufacturing process is also very simple. These plates are very suitable to serve the hot food.

Jin-Hee and et. al., have proposed the improvement in the performance of the paper cup forming machine. The normal machines can produce around 150 cups per minutes. The vibrations produced because of the operation of the machines will be minimized in order to improve the performance of the machines.
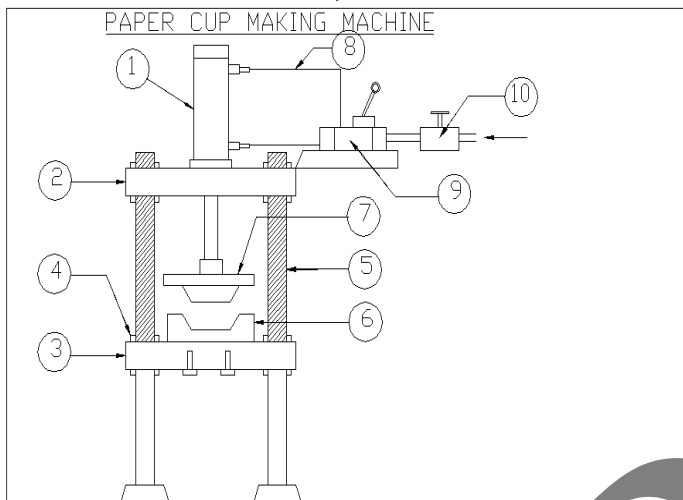
PROJECT DETAILS:

3.1 PART LIST

1. Hydraulic Cylinder
2. Top Plate
3. Bottom Plate

4. Lock Nut

5. Screw Rod

6. Die

7. Punch

8. Hose

9. Direction Control Valve

10. Flow Control Valve

2.2 DIAGRAM OF THE PROJECT:

PAPER CUP MAKING MACHINE

3.3. WORKING OF THE PROJECT:

In this paper cup making machine there is a double acting cylinder which is a hydraulic device a punch, die, screw rod, top plate, bottom plate, direction control valve, flow control valve, connectors and hoses. Hydraulic pump supplies high pressure oil to the cylinder, whose flow is controlled by a flow control valve. The oil passes through a direction control valve. This is used to actuate the piston and to specify its direction of movement. The piston is connected to a ram. At the end of the ram punch is fastened. The die in the ram can be replaced. The piston, ram and punch are the moving parts in this machine. The die is fixed on the base of the machine by screw rods. The height of the base can be adjusted by rotating the screw rod. The whole unit is fixed on the column. When the oil flows through the flow control valve, its volume is restricted to the specified amount. Then the direction control valves control the part of cylinder which it should occupy. When it occupies part A of the cylinder, it moves the ram downwards along with the punch. The punch, punches the paper kept over the die. The paper will be wet. To recover the wetness and make the shape stable a heating coil is placed in the die. Next, direction control valves are actuated which makes the air to flow in part B of cylinder. Due to air in part A is released to the atmosphere by a valve. This makes the punch to move upwards. The cup can be taken out and the next paper can be placed over the die for the next cycle.

III. DESIGN OF THE PROJECT:
DESIGN OF HYDRAULIC CYLINDER:

Cylinders are used to convert fluid power into mechanical motion. A cylinder consists of a cylindrical body, closures at each end, movable piston, and a rod attached to the piston. When fluid pressure acts on the piston, the pressure is transmitted to the piston rod, resulting in linear motion. The piston rod thrust force developed by the fluid pressure acting on the piston is easily determined by multiplying the line pressure by the piston area.

Force = Pressure X Area or F = PA

Diameter of the Hydraulic Cylinder D = 0.05 m^2

Hydraulic Pressure P =10 bar = 10 x 10^5 N/m^2

$A = \pi d^2/4 = \pi \times 0.05^2/4 = 0.00196$ m^2

$F = P/A = 10 \times 10^5/ 0.00196$

Theoretical force calculation F = 196 N/m^2

IV. CONCLUSION :

Paper cup can be manufactured at high rate with the available machines. Manufacturing normally requires hydraulic cup making machines to operate at a very high speed. But the problem is that they are used for making one or two cup simultaneously, which shows a less production rate. Therefore there may be the chances of increase in production rate by simultaneously punching the number of sheets in a single pass.

REFERENCE:

1) Anthony Esposito (2012) "*Fluid Power*" Pearson, ISBN 978-81-775-8580-3

2) Dr.R.K.Bansal (2010) "*Fluid Mechanics and Hydraulic Machines*" Laxmi Publications, ISBN 978-81-318-0815-3

3) Er.R.K.Rajput (2006) "*Strength of Materials*" S.Chand, ISBN 81-219-2594-0

4) PSG College of Technology "*PSG Design Data Book*"(2012)

5) T.J.Prabhu (2011) "*Design of Transmission Element*"

6) V.B.Bhandari (2012) "*Design of Machine Elements*" Mc Graw Hill, ISBN 978-0-07-068179-8

7) Subramanyam Pavuluri and B.Rajashekar, B. Damodhar "*Process of Press Tool Design and its Manufacturing for Blanking Operation*" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 5, May 2016

8) Jin-Hee. Lee and et. al., *Performance Improvement of the Paper-Cup Forming Machine* by Barrel Cam Optimization 3rd International Conference on Mechanical, Production and Automobile Engineering (ICMPAE'2013) January 4-5, 2013

9) Sanchit Gaikwad and Amol Kalokhe, *"Automatic Paper Plate Making Machine"* International Journal for Research in Engineering Application & Management (IJREAM) Vol-02, Issue 01, APR 2016.