

# Automatic Paper Plate Making Machine

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**Abstract** Disposable food service products were initially developed to enhance public health by improving practices in the food service industry. This requirement when combined with the environmental threat faced by us at the turn of the 20th Century and need of strong efforts in order to conserve the environment gave birth to the concept of PAPER PLATES. There are several inherent advantages in using Paper Plates as compared to cups of other materials. These Paper Plates are gaining popularity all across the globe as a beautiful and stylish way of minimizing exposure to food borne infections. Paper plates have numerous advantages like; they are manufactured in a very simple process using Food Grade Raw Materials with least waste and are easiest to recycle. They are ideal for individual servings at all kinds of parties, functions, picnic occasions, marriages, chat, tea & food joints, etc. Non-toxic in nature, the shapes and surface designs on these paper plates are attractive and present an inviting look. These paper plates can also be custom printed with an outlet's logo, brand punch line or advertising message.

**Keywords** – Plate Making, machine, paper plate, Automatic.

## I. INTRODUCTION

Disposable food service products were initially developed to enhance public health by improving practices in the food service industry. This requirement when combined with the environmental threat faced by us at the turn of the 20th Century and need of strong efforts in order to conserve the environment gave birth to the concept of PAPER PLATE. There are several inherent advantages in using Paper products as compared to plates of other materials. These Paper plates are gaining popularity all across the globe as a beautiful and stylish way of minimizing exposure to food borne infections. Paper plates have numerous advantages like; they are manufactured in a very simple process using Food Grade Raw Materials with least waste and are easiest to recycle. They are ideal for individual servings at all kinds of parties, functions, picnic occasions, marriages, chat, tea & food joints, etc. Non-toxic in nature, the shapes and surface designs on these paper plates are attractive and present an inviting look. These paper plates can also be custom printed with an outlet's logo, brand punch line or advertising message. Available in a wide variety of designs, textures, colors and sizes, disposable paper plates are gorgeous, stylish and eloquent. Adding premium aura

wherever used, these plates are made with utmost care to detail and are a unique addition to any table setting. Hence, the future of the proposed unit for manufacturing paper plates is very vibrant and will be a gesture towards supporting the usage of Eco-friendly products.

### **A Objectives**

After evaluating the existing machine the cons out weighted the pros thus generating a need to improve the overall parameters and working characteristics. The objectives identified were:

- To implement the theory studied in the academia.
- Overall efficiency improvement of system.
- Machine capacity increment.
- Automation
- Optimum use of man-hours.

## II. LITERATURE SURVEY

Disposable food service products were initially developed to enhance public health by improving practices in the food service industry. This requirement when combined with the environmental threat faced by us at the turn of the 20th Century and need of strong efforts in order to conserve the environment gave birth to the concept of PAPER PLATES. There are several inherent advantages in using Paper Plates as compared to plates of other materials.

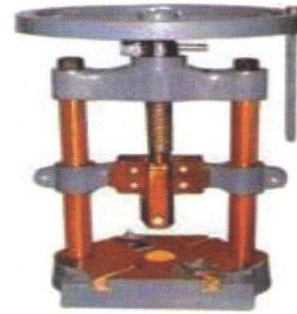
A paper plate is a plate made out of paper and often lined with plastic to prevent liquid from leaking out or soaking through the paper. The base paper for paper plates is called Kraft. This Kraft is coated with the thin layer of silver film. This paper is then pass through successive stages of rolling, and then gets wounded on a roller. Then it is cut for required dimensions (here 14x28 in). After then this paper of required dimensions is pass to the press machine for giving required shape of plate. The operations from taking out the roller of coated paper, cutting it for required dimensions and then transferring it to the press machine are carried out manually. This project work deals with automating the above mentioned operation of the manually operated paper plate making machine available at “S.M. manufacturing and trading” company at Bhandara(M.S)

Disposable plates are used for serving food because of their easy handling and disposal. Traditionally, disposable plates made of leaves were used in India. Different types of plant leaves have been used for plate making in different states. The present market of disposable plates, however, largely comprises of paper and expanded polystyrene (foam) plates. The three types of leaf plates studied are Areca (*Areca catechu*), Siali (*Bauhiniavahlia*) and Sal (*Shorearobusta*). More than half of the production cost of leaf plates is attributed to procurement of raw material and labour wages. This indicates that leaf plate making is a labour intensive business creating employment in rural areas. Areca plates (Rs 7/ plate) have the highest market price while paper plates (Rs 0.5/ plate) have the lowest. It was found that the energy consumption of making Sal and Siali plates is comparable to that of making the paper plates; while the energy consumption of making Areca leaf plates is the highest. Nowadays, Sal and Siali plates have an embedded polythene sheet. Thus, looking at the currently available designs in the market, non-coated paper plates and Areca leaf plates were found to be the only completely biodegradable disposable plates.[2]

A paper plate is a plate made out of paper and often lined with plastic to prevent liquid from leaking out or soaking through the paper. The base paper for paper plates is called Kraft. This Kraft is coated with the thin layer of silver film. This paper is then pass through successive stages of rolling, and then gets wounded on a roller. Then it is cut for required dimensions (here 14x28 in). After then this paper of required dimensions is pass to the press machine for giving required shape of plate. The operations from taking out the roller of coated paper, cutting it for required dimensions and then transferring it to the press machine.

Established in the year 1972, “Excellent Paper Plate Engineering Company” is engaged in manufacturing, exporting and supplying Paper Plate Making Machine & Dies. In this line, project offering Paper Plate Machine, Paper Plate making Machine, Paper Plate Making Machinery, Paper Plate Making Raw Material, Paper Thali Making Dies and Core Thali, etc.

#### **Manually Operated Machine:**



**Fig2.2 (a).Manually operated Machine**

For making a roll of laminated Kraft. Withdrawal of laminated roll keeping this roll for manual cutting of sheets and cutting of sheets to the required size. Making a bunch of 10 sheets and transferring this bunch to manual press machine. Manual pressing of sheets. Removal of sheets and extra material from the press machine manually

### **III. SYSTEM ARCHITECTURE**

In our system of automatic paper plate making machine, we are having the main system blocks as below which include the single phase AC power supply (230V, 50Hz), the proximity sensors, control panel, digital display counter, hydraulic cylinder, hydraulic power pack. In this system we are going to make paper plates automatically with the help of PLC programming. Paper plates can be manufactured at high rate with the available machines. Manufacturing normally requires hydraulic press machines to operate at a very high speed. But the problem is that they are used for making one or two plates 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. There are few suggestion and improvements that can be carried out for this press machine. The system is suggested to be built with larger size of machine as the Press components. It will give more power to press the devices. Secondly, usage of the cylinder of electric type or hydraulic type is recommended to be as the future study. Another suggestion is to use the digital

timer for the machine as the digital timer can show the user about the timer of the operation more clearly than analogue timer. Proximity sensor is the main component in our system. This is used to sense the punching operation of the cylinder which counts the total punches which in result gives us the total count of the plates by the PLC used in our control panel. These are noncontact proximity device that set up a radio frequency field with an oscillator and a coil. All techcylindrical sensors are available in diameters ranging from 4mm (.16 in.) to 30mm (1.18 in.) With sensing distances up to 40mm (1.57 in.). Most models feature nickel plated brass (BN) housing, but stainless steel (SS) and non-metallic versions are available.

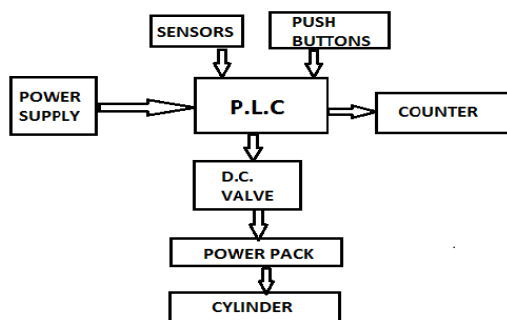


Fig3.1 (a).Block Diagram

**A Power Supply:**

For the paper plate making system we are using single phase AC (230V, 50Hz) power supply for the operation of the system.

**B Counter**

The digital display counter is mounted on the control panel. This digital counter displays us the total count of the paper plates made. All the data that counted while making the paper plates is saved. Digital counters are electronic devices that perform a variety of counting functions.

**C Proximity Sensor**

Proximity sensor is the main component in our system. This is used to sense the punching operation of the cylinder which counts the total punches which in result gives us the total count of the plates by the PLC used in our control panel.

**D Relay Card**

The relay card used in the control panel for the operation of switching. Each relay can be controlled separately. They are provided using diodes and transistors for switching. LED for each relay is provided to show which relay is switching. Pull up provided for better operation.

**Power Circuit Diagram:**

The above fig, 3.3 shows the power circuit diagram for our automatic paper plate making machine system. For this we

are having a three phase AC power supply which is of R,Y,B.

Three MCB's are present for the supply of power. The output of PLC is feed to the contactor which is given to the overload relay. This will automatically control the rotation of motor. This is all about the power circuit of our system.

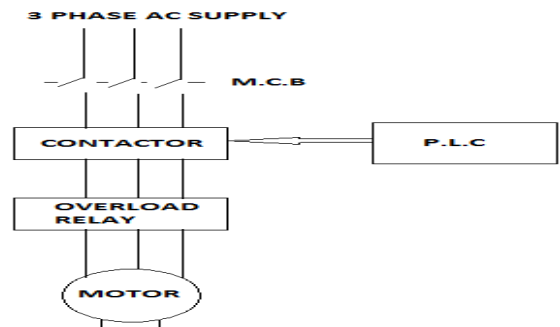
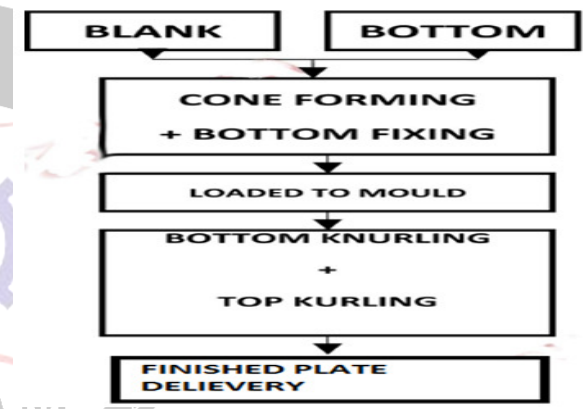


Fig3.3 Power Circuit Diagram

**Flow Chart**



**IV. RESULT ANALYSIS**

**A Fully-Automatic Machine**



This system is operated manually as well as automatically, here no need to hold the paper every time. Just insert the

paper at a time and the plates are automatically get produced due to the automation of the system and the per hour production is increased which is around 900 plates per hour.

This is a fully automatic single die paper plate making machine which involves no labour. You have to put the laminated roll on work station; machine takes the paper itself and gives the finished products automatically.

**B Fully-Automatic Machine**



This is a fully automatic single die paper plate making machine which involves no labour. You have to put the laminated roll on work station, machine takes the paper itself and gives the finished products automatically.

The paper plates are disposable and environment friendly to use. Also, increase in productivity in analytically proved with the help of Break The set objective such as efficiency, flexibility and ergonomic aspects are met individually to a remarkable extent -Even analysis. Thus one can conclude that the development machine can produce more plates efficiently than the previously existing machine and also economically feasible.

**C Program**

**Element Comment - [Input Contact]**

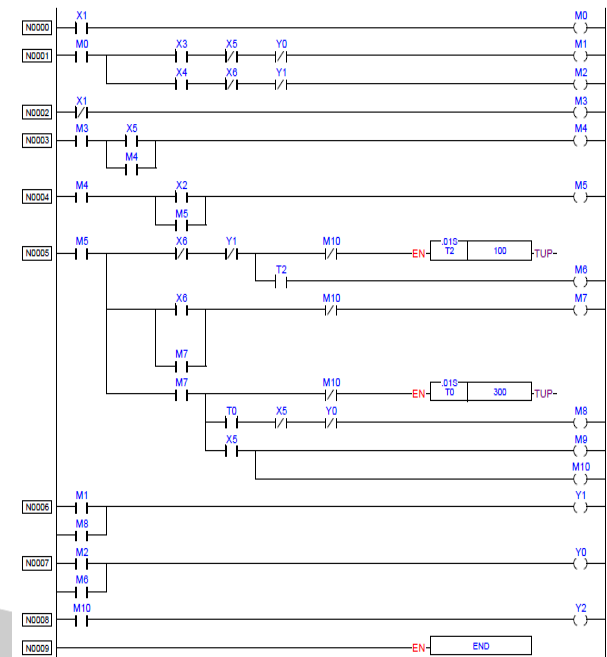
**INPUT RELAY**

- X1 Auto/Man
- X2 Process Start
- X3 Rev
- X4 Fwd
- X5 Rev Limit
- X6 Fwd Limit

**Element Comment - [Output Relay]**

- Y0 Fwd

Y1 Rev  
 Y2 Cnt Plse



**Element Comment - [Internal Relay]**

- M0 Manual
- M1 Manual Rev
- M2 Manual Fwd
- M3 Auto mode
- M4 Home Position
- M5 Process Start
- M6 Auto Fwd
- M7 Auto FWD Cmplt
- M8 Auto Rev
- M9 Auto REV Cmplt
- M10 Cycle Cmplt

**Element Comment - [Timer]**

- T0 Pressing Time
- T2 Reverse hold time

**V. CONCLUSION**

Paper plates can be manufactured at high rate with the available machines. Manufacturing normally requires hydraulic press machines to operate at a very high speed. But the problem is that they are used for making one or two plates 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.



## ACKNOWLEDGMENT

It gives us great pleasure in presenting the project report on 'Automatic paper Plate Making'.

We would like to take this opportunity to thank my internal guide Prof. L. K. Chouthmol for giving me all the help and guidance We needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful.

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