

# Development in Electric Operated Papad Making Machine

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**Abstract-** grains are the daily staples, consumed in India in different forms such as Papad, Chapati and Tandoori Roti. As the grains contain different types of nutrients and protein which are the most important part of diet. Different grains varieties have been used for the production of different types of flat breads. From some last years most people tried to improve the quality of the flat bread by varying various components required such as percent of salt and water, various ingredients etc. They usually varies some proportions of water or salts or add different types of ingredients, preservatives, artificial fats ,etc so that it can become more tasty and be preserved for more period of time. Most of the world diets contains different types of grains ,with different percentage to make there diet a healthy one as it is rich source of proteins. Various types of technology, ingredients and methods are use to make various types of flat breads .from last decades most of the atomization has speed up the production with the use of modern technology.

**Keywords-** roti, papd, flat breads,roller.

## I. INTRODUCTION

Papad is a popular and tasty food item in the Indian diet since many centuries. Traditionally the activity was confined to household Papad making but in view of increasing demand and availability of machinery (mechanization) it has now been developed in cottage and small scale sector. Manufacturing of Papad is one of the traditional activities in the rural area in the Country. Its preparation method is cumbersome and unhygienic. The dough prepared by kneading the grains/daal mixture is cut into balls and hand-rolled using roller and plate. The major drawback of this manual process is the rolling capacity which can produce only about 30-40 Papad/ hour. Papad is either leavened or unleavened flat bread consumed throughout the Indian subcontinent and other parts of Middle East. It is usually prepared from whole grains and sometimes yeast and fat is also included in the formulation to improve the dough handling, mixing and textural properties. The product is prepared by mixing the grains with water and other ingredients to develop the dough, sheeted and dried for short time. They

have creamish brown color generally prepared in households, forming a cheap source of protein and energy. The grains is mixed with water, shortening and salt, sour dough or yeast, and is creamish brown to brown in color.

## II. CONSTRUCTION

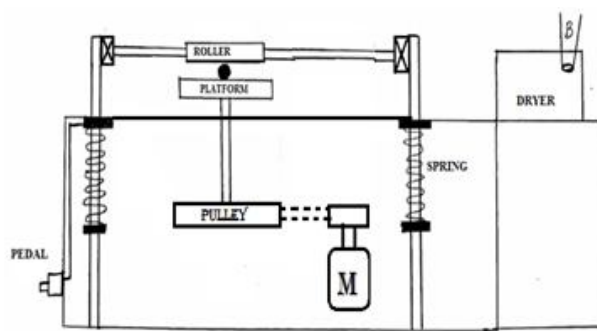


Fig. 1 Conceptual diagram of Papad Making Machine

Figure shows a schematic sketch of machine along with its components and various drives. It consists of a motor for its initial drive with specification 0.5HP, with shaft speed of 1440rpm, & power rating of 0.37KW, further fixed to frame of the machine. Shaft of the motor is mounted with a 1.5 inch pulley having a V-groove to mount V-belt. Belt is further connected to a pulley of 8 inches that gives 1<sup>st</sup> speed reduction. 8 inch pulley is mounted on a shaft which is further connected to a pair of bevel gear having 18 number to teeth with velocity ratio of 1. Bevel gear is incorporated into mechanism to transmit power & rotation at 90°. Shaft of bevel gear is further connected to rotating platform where material for making papad is kept in spherical form. All these assemblies including gear, pulley, belt & motor are fixed to a frame having dimensions, Machine is having two vertical post to mount the horizontal roller. Bottom ends of post are fixed to frame & top ends are provided with bearing to mount the shaft of roller. Roller itself is having bearing to have rotation within itself. Springs are mounted on vertical post with square & grounded ends fixed to post. Operator pedal is connected to top of the springs that exerts force applied by the worker. The

machine further has a dryer located at the side of Papad platform that dries the Papad with the help of dry air.

**III. WORKING**

Initially a piece of circular plastic is taken on which the Papad material would be pressed. Plastic is provided with oiling to avoid sticking of Papad at high pressures. Papad dough is prepared separately with mixture of refined grains & water along with additives and is placed on the lubricated plastic. Another same piece of plastic is kept above it & covered properly. A light pressure is applied on the plastic above it to press it a little that avoids slipping of material during rolling. Switch is made ON and motor is started. Horizontal circular platform starts rotating with a designed velocity. Now this whole assembly of plastic & Papad dough is placed on the rotating platform & a slight pressure is applied on the pedal by the operator. The operator continues to apply force on the pedal, with the application horizontal roller moves downward pressing the material. With downward movement of horizontal roller, friction between roller & Papad exerts rotation in the roller & the roller starts rotating with some velocity. Roller forms a line contact with the Papad material exerting a force that flows along its circumference leading to flattening of Papad. Operator continues to apply force on the pedal until the required thickness of Papad is reached. Further operator removes force and plastic & flattened Papad is taken out, upper plastic is taken out & shifted to dryer compartment for drying. Here it is kept for about 1minute, until the making of next Papad, for drying of its moisture, this operation would reduce the drying time of Papad. First operation is completed & another material is performed with same procedural steps.



**Fig. 2 Cad model of papad makinng machine**

**IV. CALCULATION**

**1) DESIGN OF V-BELT**

Rated Power,  $P_{out}=0.37kw$ ,  $\eta_{vbelt}= 0.90$ ,  $P_R =P_{out} / \eta_{vbelt}=0.41 KW$

1)Design power,  $P_d= P_R \times k_1=0.451KW$   
 $k_1=1.1$ ---(line shaft)

2)  $D_1=38.1mm$   
 Peripheral velocity (from D.T.  $N_1=1440 rpm$ )  
 $V_p=(\Pi D_1N_1)/1000 \approx 2.87 m/sec.$

3) Assume negligible slip:-  
 $V_{driven}=V_{driver}$   
 $D_1N_1=D_2N_2$ ,  $D_2=203.2 mm$

4) Angle of Lap ( $\theta$ )  
 $\theta_1= \Pi-( D_2- D_1)/C=2.45 rad$  -----( $C=D_1+D_2$ )  
 $\theta_2= \Pi+(D_2- D_1)/C =3.82 rad$

$\mu_1=\mu_2= 0.3$  ----->for C.I. & rubber belt

5) Belt tension ratio:-  
 $(F_1/F_2) =9.56$  &  $(F_1/F_2) =33.$   
 Select lower value,  $(F_1/F_2) =9.56$

6) Length of belt:- $L= (\Pi/2) \times (D_1+D_2) + (2 \times C) + (D_1- D_2)^2/4C= 88.9m$

**2) DESIGN OF SPRING**

Load of operator on pedal (As per ergonomic study), average human can exert 70N load comfortably.

Weight requirement of Papad rolling- 0.5-0.7kg (data obtained from Lijjat Papad)

Papad size considered- 20cm dia. 1mm thickness, Pressure exerted= 222.92Pa

To overcome this, Let  $C=5.5$

Material- chromium vanadium steel SAE 6150  
 $S_{ut} = 1690 Mpa$ ,  $S_{ys} = 770 Mpa$

$\tau_{max} = S_{ys}/F_s = 385 Mpa$

1) Diameter:  $\tau$

$$\tau = (8FC/\pi d^3) * K_w$$

$$K_w = [(4c-1)/(4c-4)] + (0.615/c) = 1.27$$

$$385 = [(8 * 70 * 5.5) / \pi d^3] * 1.27$$

$$d \approx 2mm$$

Checking Shear Stress,

$$\tau = (8FC/\pi d^3) * K_w$$

$$\tau = 245.09Mpa \leq \tau_{max} = 385 Mpa.$$

Shear stress value is under safe zone with this index value.  
Spring is under safe zone.

#### 2) Coil Dimension:

$$C = D_m/d = 11\text{mm}$$

$$D_o = D_m + d = 11 + 2 = 13\text{mm}$$

$$D_i = D_m - d = 11 - 2 = 9\text{mm}$$

#### 3) No. of Coils:

(Deflection of 40mm by equating volumes)

$$\delta = [8FD_m^3/Gd^4] * n = 9$$

Taking square and ground end

$$n = n + 2 = 11$$

#### 4) Free length = $n d + \delta + 0.15 \delta = 68\text{mm}$

### V. ADVANTAGES

- The design has reduces size and easy to use in home.
- Machine will be affordable to middle class. Cost of this machine is up to 12,000rs.
- Changing Papad dimensions in this machine is comparatively an easier task, just by application of pressure over a rotating material. It does not require any assembly changing and time consuming activities.
- It is the single handed activity.
- Energy consumption is very low as compare to recent available techniques.

### VI. CONCLUSION

In this project we have concluded that as day by day there is more requirement of skilled labor because of faster rate of development in food processing area. Hence to reduce human effort and to reduce working time for Papad flattening operation we have developed simple Papad making machine for production of Papad which plays an important role in middle class people's business. Our machine makes Papad with the help of rolling & pressing mechanism and v-belt drive with pulley arrangement is used to transmit power.

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