

# Modelling of variable size Paneer cutting machine: Experimental approach

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**Abstract—** The economic downturn is among the worst enemy to all of mankind. The unstable economy performance also causing industries to collapse especially the low and medium ranged firm. This would much affect the increment of food prices and all groceries that available in the market. This would tighten up our budget and might as well affect our health and lifestyle indirectly. Hence, the purpose of this project is to design of a semi-automatic low cost Paneer cutting and packaging machine. Most of the food processor available in the market is imported and costly as well as additional manpower and time consumption caused by manual processing. The development for this machine begins by identifying problems that occurs. Then, studies on the food processor available in the market as well foods which are directly related are next in line. Then only the machine is design based on the concept adapted from the problems hence, the purpose of this project is to design of a semi automatic low cost paneer cutting and packaging machine for small scale industry

**IndexTerms—** Paneer cutting machine, Packaging system

## I. INTRODUCTION

The development of manually operated slicing machine is necessary in order to produce machine that is portable and at the same time high in performance compare to its size. Industries nowadays are trying hard to improve machine efficiencies to maximize outputs. The higher the efficiencies the more amounts of energy and cost are reduced. Hence, this will directly increase the profit. But, for manual machine wise, the higher the efficiency, the easier the machine would be operated for it requires less energy in this we will briefly discuss on foods which are directly related to the project and overview different types of cutting machine; manual or electrically powered with different cutting method in order to increase the production

## II. METHODOLOGY

The project work is divided into two parts:

1. Cutting Mechanism.
2. Packaging Systems.

### 1) Paneer Cutting Mechanisms

Construction

Aim is to cut paneer pieces into three sizes i.e. 250gm, 500gm & 1 kg from a 5 kg piece. Now the equipment is based on scotch yoke mechanism. It is a vertical platform having a box like arrangement at the bottom. The scotch yoke mechanism will lift that box up & down causing the vertical movement. Now the main purpose of this mechanism is to cut paneer pieces. For that a frame is attached in the box at bottom. The frame carries thin wires separated at a specific distance.

As the mechanism moves up & down, the frame carrying the wires cuts the paneer into the required sizes. Thus, the required sizes of paneer are obtained. Now, we can't pieces into 3 sizes, i.e. 250gm, 500gm & 1 kg. For that calculations are done & to achieve maximum pieces of paneer, three standard sizes of the wire frames are derived... Means External size of the frame will be same but the position of the thin wires will a change to achieve the required size & weight.

Size of the machine:

- 1) Base – 60 X 70 cm
- 2) Vertical Platform – 90 X 52 cm
- 3) Distance between motor & chain wheel – 20 cm
- 4) Wire Cage – 33 X 39 cm
- 5) Movable part 75 cm from base.

### Calculations of the mechanism

#### 1) Calculation for the sizes

Aim is to cut paneer pieces into three sizes i.e. 250gm, 500gm & 1 kg from a 5 kg piece. Now the equipment is based on mechanism operated by an AC 60 rpm 12V geared motor. It is a vertical platform having a box like arrangement at the bottom. The mechanism will lift that box up & down causing the vertical movement. Now the purpose of this mechanism is to cut paneer pieces. For that a frame is attached in the box at bottom.

As the mechanism moves up & down, the frame carrying the wires cuts the paneer into the required sizes. Thus, the required sizes of paneer are obtained. Now, we want pieces into 3 sizes, i.e. 250gm, 500gm & 1 kg. For that calculations are done & to achieve maximum pieces of paneer, three standard sizes of the wire frames are derived. Means External size of the frame will be same but the position of the thin wires will change to achieve the required size & weight.

## 2) Data from the company:

The standard size of paneer slab which is obtained from press machine is of 30 X 24 X 5 cm. This slab is of 5Kg. There are 2-3 machines of same size output. So our aim is to cut this large piece into 250gm, 500gm & 1kg sizes. So, the best & cheapest option is by press cutting. We are going to press this large slab through a frame of thin wires so that these wires will cut it into the required size. Hence the task is to specify the position of the wires.

There are three frames designed. All the three frames are of same size except the position of wires. The thickness & length of the sizes are kept same. The size of width changes which results into different weight.

Size of slab 30 X 24 X 5 cm for 5kg. So for 250 gm, 500gm & 1 kg sizes are calculated as bellow:

Sr.No.	Weight	Size (l X w X t) cm
1	250gm	15 X 2.4 X 5
2	500gm	15 X 4.8 X 5
3	1000 gm (1Kg)	15 X 9.6 X 5

## 3) Calculations For The Chain Drive Rpm

Now the motor used is of 60 rpm. In order to reduce it into less rpm chain drive is attached. The required rpm are 20-25 so that the process gets complete in less than 1 minute.

Now,

No of teethes on driving sprocket = 18, Driving sprocket rpm = 60, No of teethes on driven sprocket = 42

Driving sprocket rpm = ?

Now,  $T1 = S2$

$T2 = S1$

Therefore,  $18 = X$

42 60

$X = 25.71$

Driving sprocket rpm = 25.71 = 26.

## 4) Cutting Force:

$$F = A \times T_B$$

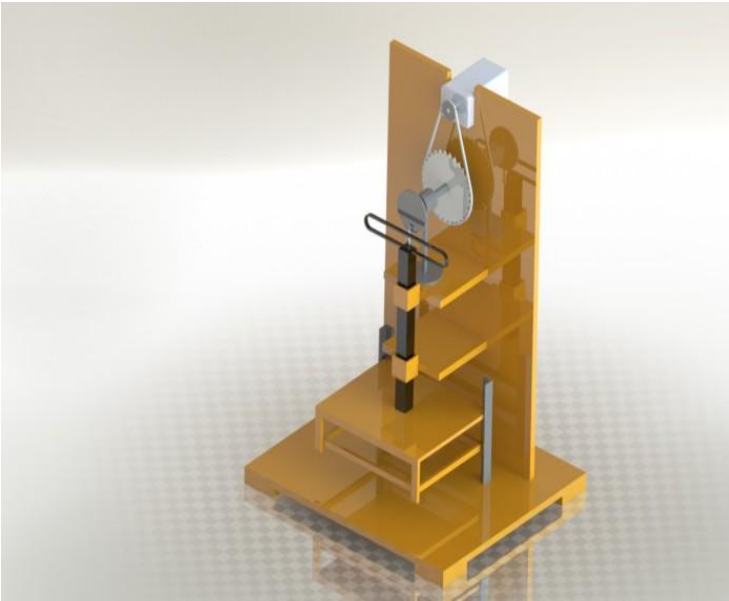
F = CUTTING FORCE

S = MATERIAL THICKNESS

L = TOTAL CUTTING LENGTH

A = L X S = SHEAR AREA

T<sub>B</sub> = SHEAR STRENGTH



### III PACKAGING SYSTEM

Paneer being a perishable commodity is highly susceptible to physicochemical and microbiological changes. Therefore, its packaging must provide protection against these damages while maintaining its quality, sales appeal, freshness and consumer convenience. Various packaging materials utilized for packaging of paneer include polythene sachets, coextruded films, laminates, parchment paper etc. Most of the paneer produced in organized sector is packaged in polyethylene bags because of its better barrier properties in respect of loss of moisture.

The Packaging of chemical preservatives treated paneer with and without vacuum extended its shelf life up to 35 and 50 days, respectively at 8 °C. Vacuum packaging of cow milk paneer is reported to have enhanced its shelf life from 1 week to more than 30 days at 6 °C. Paneer packaged in high barrier film under vacuum and heat treated at 90 °C for 1 min had a shelf life of 90 days under refrigeration. paneer from standardized buffalo milk having 6% fat and packaged in polyethylene and vegetable parchment paper and then stored at 6–8 °C. They found that decrease in moisture content of paneer was more in the samples packaged in vegetable parchment paper than in polyethylene. It cannot be stored for more than 1 day at room temperature in tropical countries..

### IV CONCLUSION

Paneer is analogous to fresh, unripe soft cheese made by heat and acid coagulation of milk. It is very popular in South Asia and is used for preparation of various culinary dishes and acts as an ingredient for vegetables dishes and snacks. There is a wide variation in the chemical composition and yield of paneer due to the use of varied techniques by paneer manufacturers. Hence there is a need to adopt low cost paneer pressing device and standard procedure for paneer manufacture. Irrespective of the type, milk should be standardized to a fat and SNF ratio of 1:1.65 so that the final product conforms to PFA requirements. Good quality paneer is obtained by heating milk to about 90 °C, acidifying the hot milk by adding citric acid solution (1–2% strength) followed by removal of whey and pressing of the curd in chilled water in order to enhance the yield of paneer. The use of mechanized and semi-mechanized systems which involves membrane processes and in-package text urination. Small scale entrepreneurs like SHG and farm women can utilize the low cost paneer pressing device followed by quality training and marketing facilities. Thus the system proposed in this thesis is suitable for small & micro scale industries due to its simple construction & effective cost.

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