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## DESIGN AND FABRICATION OF MANGO CUTTING MACHINE

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### ABSTRACT

In India raw mangoes are widely used as pickles and chutneys. In almost every house, mangoes are used to make cucumbers and chutneys. In Gujarat, many local growers have flourished in the cucumber industry. Basic functions such as cutting, trimming, peeling and rubbing, dialing, and hand-handling and hygiene are performed in Gujarat. All of these jobs are done only by men and women in the industry and are also tedious and require a lot of work. Therefore, these tasks need to be done automatically and quickly. Cutting and cutting cubes is one of the most important steps in the processing of raw mango fruit. Mechanical mango cutting and cube cutting can be more accurate than hand-made mango cutting operations. Reduces processing time and improves the efficiency and accuracy of green mango cutting and cube cutting. However, only a small amount of work has been done and published, in the development of cutting and cutting cube machines. Therefore, the current research is designed to develop an efficient, efficient and cube-cutting machine for industrial processing machine.

**Keywords:** Mango Cubes, High Production, Knife, House, Hygiene, Affordable, Small Industries.

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### I. INTRODUCTION

Mango is one of the most popular fruits (scientific name *Magnifera Indica*) and is cultivated in more than 120 countries, mainly in Southeast Asia and Asia. India can be a leading country in mango cultivation and produces about 64% if you take care of the total mango produced in the world. It is thought that the most important fruit that covers 34% takes care of the environment and 27% takes care of fruit production nationwide. In Bharat the area under mango cultivation was about 2500k angular distance and about 18002.4k metric abundance of mangoes was created throughout the year 2012-13. Gujarat has contributed 5.7 percent to mango cultivation (Anon, 2013). In the state of Gujarat, the areas under mango cultivation were about 141258 angular distances and in terms of 1003706 mangrove masses were created throughout the year 2012-13 (Anon, 2013). Therefore, mangoes are being processed into several markets including mango juice, mango juice, beans, mango juice and jam. Managing mangoes is eliminated by hand and in impure ways. Most Gujarat mango pickle businesses do the mango cutting into cubes that create a boring, bulky and hard-working environment, because it involves handicrafts. It is therefore important to do these tasks mechanically by building cost-effective equipment that can reduce time but as a cost to operate and build a more healthy approach. In this operation the cutting and cutting of the green mango cube is excellent as it involves more functional pieces and cutting the cube compared to cutting with a knife by hand. It reduces fruit damage and improves strength and accuracy. However, only limited work is done and revealed in the event of cutting and cube cutting machines. Therefore, this study was conducted with the specific objective of developing a compatible degree, an economically mature mango cutter and a cube cutter to adjust the embossing process.

### II. LITERATURE REVIEW

Available literature on the design, natural and engineering properties of green mangoes, the requirements of this chapter include published reviews of raw mango processing equipment, development and operation of different types of fruit slicer and cutter, and various types of cutting and cube cutter by researchers. The main purpose of the literature review is to know the current developments in our research area, the existing problem-solving methods used by researchers in current research, the effectiveness of their methods and to compare existing methods / solutions with our research work. Design and production of cashew nut wrapping machine (2017), in this paper, hand-crafted specifications for further development can be achieved, with automatic separation of kernel and cashew nut shell, increased production rate using multiple cutters, machine. can be rearranged to reduce overall weight. The aim is to learn the function and design of the cashew nut shelling cutter. Automatic cashew nut cutting machine (2017), cashew nut cutting machine works using crank machine but requires manual labor to do the processing. This research helps design other functions

automatically, such as the separation of nuts and part of waste. A review of the cashew nut wrapping process (2016), this paper explains that the normal process of cashew nut and shelling is time consuming, and has a low production rate. It should therefore be mechanized to save time and improve quality. Extracted roasted cashew nuts is usually done by breaking the nut in person to obtain an edible grain. And to learn the normal process of cashew nut and how it affects mass production and efficiency of the whole process. An analysis of the impact of V-Belt rubber structures on Cvt efficiency (2017), this paper explains that the stiffness of the upper band and the coefficient of collision include a reduction in slip. The smooth value indicates that this is an important component of total energy loss. Ultimately it improves machine performance. Strong mechanical system of the belt-pulley (2014), how the installation of bending curves leads to uneven speed and friction in the spans and reduces the bending angles of the belt on the pulleys, especially small radii. The stiffness of the bend reduces the bending angles, causes the full slide of the band on the pulley, increases the efficiency of the power and reduces the maximum transmission moment. The effects of belt speed on stable movement are reduced as the bending strength increases. Use of mango seeds (2012), mango seeds commonly used in food ingredients. Mango seeds should be used and not simply thrown away as waste. Mango seeds can be used as a potential source of active ingredients antimicrobial compounds, cosmetics, activated carbon and, in addition, can also be processed into active medicinal food products that are digested into active medicinal food products. Development and extraction of oil from mango seed kernel (2017), mango kernel is used in cosmetics. Mango seed oil contained high-quality non-permeable substances that can be used for cosmetic purposes.

### III. PROBLEM IDENTIFICATION

#### A. Manual Mango Cutting

Green mango cutting using a traditional tool for time and labor operation is also unsafe because it leads to injuries such as cutting workers by hand and fingers and is difficult to cut mangoes due to the presence of its strong seeds. The soft metal used in the traditional tool, so after cutting the black color appeared on the cut part of the green mango and in impure ways Handling mangoes is done by hand and in impure ways, it is also dangerous to handle. Most Gujarat mango industries perform basic services such as milling, cutting, cutting, grading, and dialing. All of these tasks are tedious and difficult, as they involve manual labor.



#### B. Mango Cutting Using Machine

This is the default time when it is widely described as changing the manual effort in all degrees of automation. Work is always an important part of the system despite the changing needs of physical inputs as the level of use of equipment increases. Degree of automation is of two types, viz. Full automation and Semi automation. In semi-automation a combination of manual effort and mechanical effort is required while in full automation human participation is minimal. There are a variety of raw mango cutting machines currently available in the market, with the production rate of raw mango cutting machines varying from 100kg-500kg per hour. or more but the price of it is also very expensive and its size and very large, inaccessible to small businesses and cities.

### IV. SOLUTION

Because of the above problem we are trying to build such a machine to solve the above problem and the machine is bought by small semiautomatic businesses with low cost.

#### Objectives

- Quick and swish operation.
- Keeping clean.

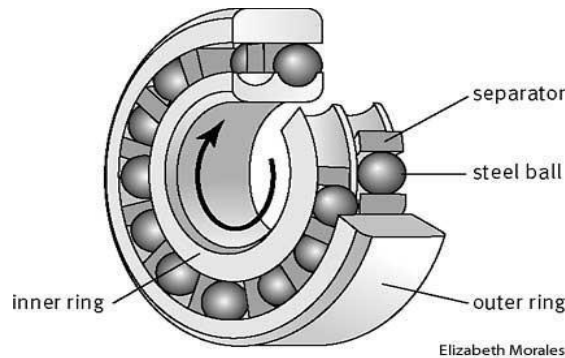
- Cut mangoes into pieces, this can be used to make mango pickles.
- Converting a hand-cutting system into a machine-operated cutting system.
- Increased productivity.
- To overcome the use of time.
- Reduce labor insecurity.

## V. CONSTRUCTION

The following are the main components of the projects

### A. Ball Bearing

Ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between bearings. the purpose of the ball bearing is to reduce rotational friction and to support radial and axial loads. It achieves this by using at least two races to contain balls and to transfer loads with balls. In most applications, one race is suspended and the other is attached to a rotating assembly. As one of the carrying races rotates it causes the balls to turn with it. Because the rolling balls have a much lower coefficient of collision than when two flat surfaces collide. balls and races. However, they can tolerate differences in internal and external races.



### B. Shaft

The shaft is part of a machine that transmits rotational motion and force. It is essential for any mechanical system where power is transferred from a moving machine, such as an electric motor or engine, to other parts of the system.

### C. Crank Shaft

A crankshaft — crank-related — is a component of a machine that can perform the transition between repetitive motions and rotating movements. converts circular movements into parallel movements.

### D. Connecting Rod

Shaft connecting rod connecting the piston to the crank or crankshaft on the repeater engine. Along with the crank, it makes an easy way that turns repetitive movements into circular movements.

### E. Frame

Frame material using soft metal (channel L). When selecting frame material we have 3 circular pipe, square pipe and L channel, the reason for choosing L channel is to make the frame easier and for the purpose of mounting.

### F. Motor

We used a 2-step reduction with a stroke length of 330mm so we statistically chose the engine.



**G. Pulley**

Since we have chosen 2 stage cuts to work well and produce a small amount of sound so we have used 2 16 inch pulses, 1 5inch pulley and 2.5 inch pulley of standard size.

**H. Hopper**

We have made a hopper in such a way that once we have planted the seed in it, the seed will replace the previous seed during lactation.

**I. Cutting plate**

Fixed cut blades made of stainless steel with a sharp cutting edge 1mm, 80mm long and 80mm wide. The size of the blade was 3mm to withstand the cutting pressure of the mango pieces.

**J. Collection unit**

A collection unit used to collect the extracted cubes from the inclined hopper provided under the cutting unit.

**K. Cube Cutter Frame**

The length and width are determined based on the length of the mango slide. The frame gives power to the cube cutter.

**L. Belt**

A band is a flexible material used to connect two or more mechanical rotating shelves, usually in parallel. Belts can be used as a source of movement, to effectively transfer power or to track related movements. Belts are fastened over the pulleys and may have twists between the pulleys, and the shafts do not need to be aligned.

In a dual pulley system, the belt can run pulleys normally on one side (same as on parallel shafts), or the belt may fall, so that the direction of the driven shaft is reversed (opposite the driver. If parallel shafts). Belt drive can also be used to change rotation speed, either up or down, using pulleys of different sizes.

As a source of movement, the conveyor belt is a single application in which the belt is adjusted to carry a continuous load between two points.

**VI. WORKING**

First we cover all the components according to our project concept. Then first we start the machine by changing the motor and then we load the machine tray with mango due to the gravitational force the mango goes down to the ground due to the slope and touch the reversing blade and cut the mango or break the mango automatically. In this way our project works.

**VII. DESIGN METHODOLOGY**

In our attempt to design a special machine we have adopted a very careful approach, the overall design work is divided into two parts in particular;

- System design
- Construction of machinery

The design of the system is mainly concerned with various physical and ergonomics issues, space requirements, the arrangement of various parts in the main machine frame number control area of these controls for easy maintenance of continuous development; m / c weight from ground etc.

In the construction of the Mechanical section in two phases.

- Design components
- Parts to be purchased.

In the design components the data design is done and the size obtained compared to the next size is easily available in the market this makes the integration easier and the task of servicing the background production. The various tolerances in the work are specified in the production diagrams of the process charts that are being

prepared and transferred to the production phase .Partments must be purchased directly and specified and selected from standard catalogs.

#### **A. System Design**

In system design we focus mainly on the following parameter

##### **a) Barrier-based system selection: -**

When selecting any m / c it should be considered that it will be used in a large or small industry. Our care will be used in a small scale industry. Machine design has specific procedures for system design so the main task is to control the physical parameters so that the differences found after the machine design fit right into that.

##### **b) Classification of components: -**

Considering the boundary of the space, the parts should be arranged in such a way that their easy removal or servicing can take place otherwise the whole part should be easily visible and nothing should be hidden everywhere that could be used to plan the part.

##### **c) System components: -**

As already mentioned the system should be dense enough to be able to sit in the corner of the room. All moving parts should be properly sealed and compact A compact system gives a better appearance and design.

##### **d) Person -m / c Interaction: -**

M / c friendliness and performance are an important element of design. It is an anatomical use

The following are e.g. of this section

- Machine length design
- Energy costs in manual labor
- M / c lighting conditions

#### **B. Chances of Failure**

Loss incurred by the owner in the event of a failure is partly an important design condition. The safety feature while making the machine design is kept high so that there is little chance of failure when periodic maintenance is required to keep the m / c free from problems.

#### **C. Service Station**

The layout of the parts should be such that easy maintenance can take place especially those parts that needed regular service can be easily dismantled.

#### **D. Scope of Future Development**

Arrangements should be provided to expand the scope of work in the future as converting an effective m / c engine the system can easily be configured to be the required one.

#### **E. M / C Height From The Ground**

The comfort and comfort of the user 's m / c height should be properly determined so that they do not tire during operation .M / c should be slightly higher than the level and sufficient clearance from the ground should be provided for cleaning purposes.

#### **F. Machine Weight**

The wt amount of m / c depends on the choice of parts of the material and the size of the parts. A heavy m / c is difficult to move and if it breaks too hard it is difficult to fix.

## **VIII. CALCULATIONS**

Input data

Input Power = 50 Watts

Vehicle Speed = 0-9000 Rpm

Input Speed = = R Rpm

In designing a multi-level vibrating machine we have considered a 0.25 Hp (185 Watt) high power engine to incorporate the safety feature.



$$P = 2\pi NT / 60$$

$$185 = (2 \times \pi \times 360 \times T) / 60$$

$$T = (185 \times 60) / (2 \times \pi \times 360)$$

$$T = 4.9 \text{ N-m}$$

$$T = 4900 \text{ N.mm.}$$

$$T_{\text{design}} = 4900 \text{ N.mm.}$$



## IX. ADVANTAGES

- Fast performance
- A little work is needed
- Cut to the correct size
- Repetition of process
- Low cost
- Low maintenance
- No skill work required.

## X. APPLICATIONS

- Packing cheese
- Paneer packaging

- Potato bread preparation
- Packed Food Industry
- Cutting mangoes

### **XI. FUTURE SCOPE**

- This machine can also be used as a punch and aluminum can crusher machine for removing blades.
- By changing the cylinder we can use it in another fruit cutting machine.
- By changing the cutting tool we can make it as a juicer.
- In addition, the mango cutting machine was powered by solar energy.

### **XII. CONCLUSION**

Considering the complexities of the existing mango cutting machine, we need to design a machine that should not take up too much space in an integrated, portable and flexible, inexpensive concept so that industrialists and small locals can afford it and can make embellishments. in large quantities without compromising productivity at low cost, hygiene and safety for workers. The current study was conducted with the specific objective of developing a suitable, efficient cutter and cube cutter for the industrial processing machine.

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