Design & Fabrication of Mango Pulp Extraction Machine

Aniket Ajay Chindhe[1] Jivan Narayan Phapale[2] Somnath Balasaheb Pansambal[3] Bharat Ajinath Sabale[4]

[1,2,3,4]Department of Mechanical Engineering

[1,2,3,4]G. H. Raisoni College of Engineering & Management, Ahmednagar, India

Abstract— The pulp of the mango is usually extracted by squeezing. The squeezing force is applied over the fruit for the extraction of the seeds with the help of the hands. In food processing industries seeds are extracted by manual squeezing by hands. This process is time consuming and less hygienic. In today's era every mango is handled manually and seeds are extracted. The process of extraction is to make its pulp for processing and preserving for later use. There is no domestic appliances for extraction of mango pulp in mass production. To overcome this drawback and to make pulp extraction easier and germs free this project is designed. By this project we are getting the natural and hygienic pulp extraction machine.

Key words: Nylon Brush, Perforated Sheet, Motor Speed, SS304 Shell

I. INTRODUCTION

Mango is one of the delicious seasonal fruits grown in the tropics. Mango is a green colored fruit which turns yellow when ripen. After ripening it becomes softer and sweeter. Mango fruit is rich in pre-biotic dietary fiber, vitamins, minerals, and *poly-phenolic flavonoid* antioxidant compounds. Fresh mango is a good source of potassium. 100 g fruit provides 156 mg of potassium while just 2 mg of sodium.

In general, the common method of extracting the pulp of mango is done by manual squeezing by hands. This process involves more time and is not hygienic. Until now each mango is handled manually.

For mass production it is not possible to extract pulp of each mango manually. To overcome this drawback this pulper machine will be highly efficient, nearly untouched by human hands. As there are no domestic appliances for extracting the pulp and to overcome the difficulties, we have proposed this project.

II. BACKGROUND OF THE PROBLEM

In today's era, world facing high nutritional and food crisis. An estimation reported that as many as 840 million people faces chronic hunger however the number is increasing day by day. Which implies that one-sixth of the world's population is facing hunger. To overcome this disadvantages a huge demand of food is required for long term use. This can be done by preserving the nutritional values of the fruits and vegetables for later use.

Thus the need for alternate sources of food and nutrition has resulted in the production of food supplements. This food supplements will used to correct nutritional deficiencies and to maintain certain nutrients in the body.

III. PROBLEM STATEMENT

The deficiency of vital micronutrients and vitamins in the dietary system are a form of hidden hunger. In many countries this hunger is leading to foodborne deseases. This malnutrition and foodborne deseases are becoming burden on the country. Therefore the extraction of the pulp and their preservation will help to overcome this problem.

Purpose of this study is to design and manufacture a brush type pulping machine for *Mangifera indica* (Mango fruit).

IV. POSSIBLE MECHANISMS

The possible mechanisms for the pulp extraction process are:

1) Screw type pulper machine
2) Blade type pulper machine
3) Brush type pulper machine

In first two types amount of friction is more. Due to friction heat generation in the process is more. The fruits used for pulping are ripen. Ripen fruits are soft in nature and hence requires less force for extraction of pulp. So the mechanism we used is brush type pulping machine.

V. MATERIAL SELECTION

For the pulp extraction machine components required should have high corrosive, oxidation resistance. Along with this they should have high rusting resistance therefore stainless family is more advantageous for the machine components. While the frame is made with the material which is easily available and can be easily weld. For this cast iron is used.

A. Nylon Material

Brushes of the machine are made of nylon material. Nylon is a thermoplastic, silky material used in toothbrush bristles. Food processing brushes are Food Grade Brushes & are made in various sizes as per the clients' requirement. Fill material includes nylon bristles with base mostly polypropylene & nylon. PP base strip brushes are used for pulper machines and fruit juice extracting machines. We are using nylon brush with 10 bristles in each hole. Two nylon brushes are used on opposite side of arm for squeezing mangoes between sieves and brush.

B. Stainless Steel

The shaft and the shell of the machine is made up of SS304 material. As the stainless steel is corrosion resistant, is used for food processing units. Its low maintenance and luster make it familiar to use for many applications. Use of SS304 material make the machine hygienic and resistant from rust. Scratches doesn't affect the performance of the machine. The sieves, bushes, strips and bolts are also made from SS304 material.

C. Cast iron

The supporting base of the machine is made up of cast iron. As cast iron is easily available and cheap is used for base. It can be easily welded and available in various sizes. The frame

like structure of the machine is made with the help of cast iron C channels.

VI. METHODOLOGY

In order to achieve the objective of the project, the methodology used is based on the project development life cycle. Three major steps were utilized for development of the project which are planning, implementation and testing. Planning was done on the basis of data collection. The data was collected in two forms, primary data (experiments) and secondary data (investigations).

Different methods for pulp extraction were studied in which pulp extraction by sieving is selected. Sieving involves less time for pulp extraction and enables less loss of the pulp. In this method fruit is pressed against the sieve with the help of the brush.

VII. DESIGN CONSIDERATIONS

The feed mechanism used for machine is hopper type with redusing cross-sectional area towards machine. This reduction in cross-sectional area enables constant and steady flow of the fruits. Due to machine inclination fruits doesn't need separate mechanism to flow forward. They moved forward by their self-weight and gravitational force.

The main component of the project is the perforated sheet which contains holes of diameter of 4 mm throught its periferri. Mango is pressed against the sieves with the help of brush and squeezed between them. This squeezing results in removal of pulp in another side of perforated sheet which is then collected in barrels. Power to the brush shaft is given through motor and pulley arrangement. A 2 HP electric motor is attached to the machine. Pulleys are used for maintaining the reduction ratio of the speed.

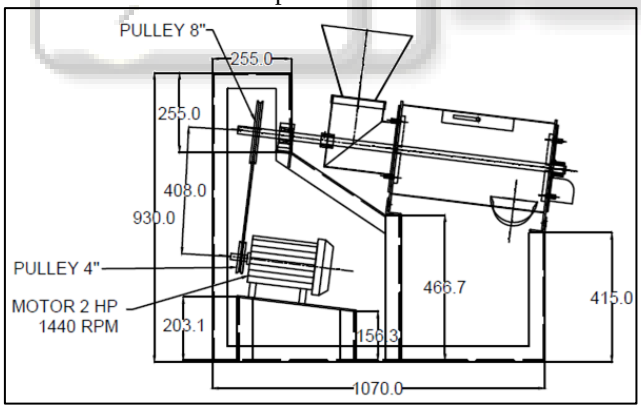

Fig. 1: CAD Model of Mango Pulp Extraction Machine

VIII. CONCLUSION

The project aims to bring a new dimensions to the industry by implementing the smart means of separating the pulp from the seeds of *Mangifera indica* (Mango fruit), saving time of extraction. Also the machine provides an alternative source of food supplements and nutritional values without changing the taste. The machine capacity is as high as 200kg of pulp can be extracted per hour. This capacity can be increased with change in motor rpm and drum size. By adopting the pulp extraction by brush type pulping machine concept the pulp can be extracted due to friction between the brush and the perforated sheet sieves.

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