

Design of Electromagnetic Pomegranate Deseeding Mechanism

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Abstract – Pomegranate a fruit gives a lot of nutrition's to human body. The structure of pomegranate is complex having outer shell and thin membrane inside with bunch of seeds. It requires heavy efforts and time to deseed pomegranate. There are various devices had been developed to deseed this fruit but not fully productive. To increase the productivity the new designs are implemented. Here in this paper a hammering mechanism is use to design and produce Pomegranate using electromagnetic principle. The hammering effect will lose the seeds and eject without damage to seeds. The system designed here gives high level of productivity and converted a traditional method into advanced mechatronic system.

Keywords: Pomegranate, Electromagnetic, Deseeds, Productivity, Hammering.

I. INTRODUCTION

The pomegranate fruit is berrylike with a leathery rind (or husk) enclosing many seeds surrounded by the juicy arils, which comprise the edible portion of the fruit. These brilliant red fruits are so attractive that most of the pomegranates purchased as fresh fruit in the United States are likely never actually consumed. While this is understandable, Americans are depriving themselves of the wonderful nutrients contained within this cool season fruit. Pomegranates are a good source of fiber and low in calories. Pomegranate juice is high in three different types of polyphenols: tannins, anthocyanins, and ellagic acid; potent antioxidants that may help fight heart disease and many cancers. . The antioxidant content of pomegranate juice is among the highest of any foods. The edible capsule around the seeds also provides vitamin B6, Vitamin C and lots of potassium.

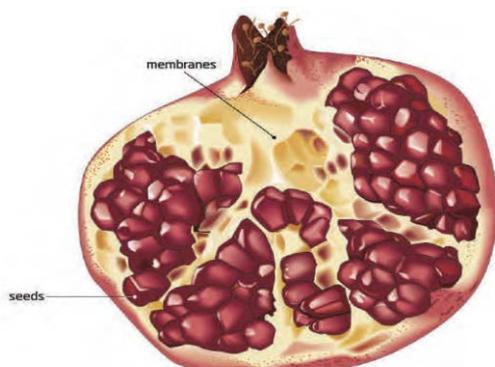


Fig. 1.1: Pomegranate structure

The amount of fruit to be used for the dishes always remains higher than actually what's consumed. The associated difficulties like time constraint, contamination, etc. make it pretty difficult for any person handling the job. So for need to automate the process of deseeding, and here with a proposal, which can aid in easing the load off the people associated with it.

II. PREVIOUS WORK

In a paper title Studies on separation techniques of pomegranate seeds and their effect on quality of Anardana by Amit Parashar, S. K. Gupta and Ashok Kumar has explained various methods to deseed, mainly sand roasting, hot water dipping and soaking in cold water to easily deseed.

In an innovation title pomegranate deseeding of Uddhab Bharali has invented a centrifugal kind of machine to easily deseed.

In a paper title Automatic Pomegranate Deseeding Machine by K. Gomathi, B. Elango, M. Gokul Kumar, B. BalaMuraliSakthivel, B. Saravanan has designed hammering methods to deseed, to easily deseed.

III. SYSTEM PROPOSED METHODOLOGY

The proposed method involves the repeated hammering action using cantilever beam over the fruit with the help of electromagnet for the deseeding process. This, when continued for the specific period of time, with time delay results in the deseeding of the fruit.

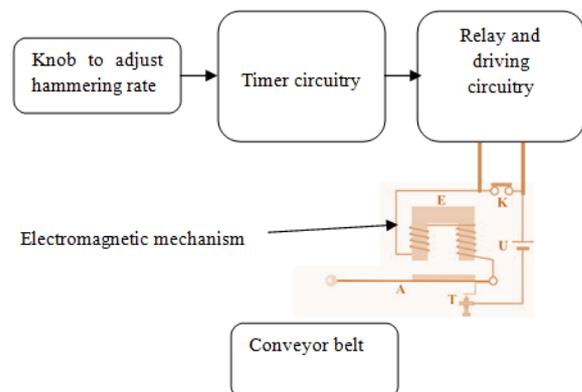


Fig. 3.1: Proposed system block diagram

It is a low cost deseeding method and easy to maintain. It is well-suited for domestic purpose. The machine consumes less power. It is compact and occupies less floor space.

IV. SYSTEM IMPLEMENTATION

The system is designed so that it can perform for deseeding and packaging of pomegranate with single operator.

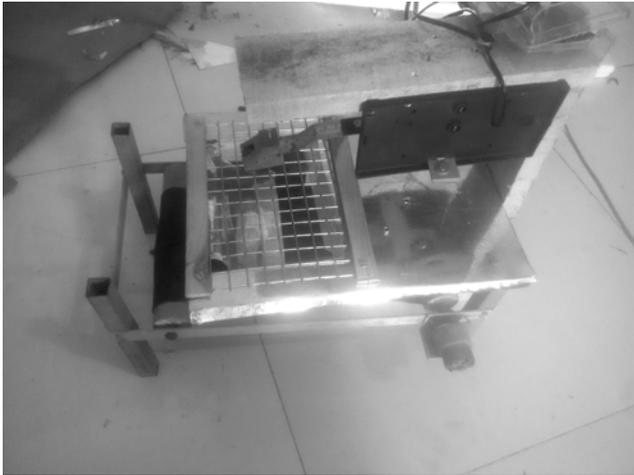


Fig. 4.1: Proposed system implementation

Proposed System depends upon the work expected from the different section of the project. The repeated application of the force over the outer hard skin of the fruit with accurate time delay results in the deseeding process. As the fruit is placed on the specially designed bowl it ensures the deseeding process without any damage to the edible part, the arils. The hammering action over the fruit is established with the help of a cantilever beam and an electromagnet setup.

The electromagnet repeatedly get energized and de-energized with a time delay. This results in the attraction and repulsion of the cantilever beam towards the electromagnet. During the electromagnet's de-energized state, with the greater force, the cantilever beam hit the fruit. The above repeated action, for certain period of time, results in the complete deseeding of the fruit. The only thing that the human being has to do is to place the fruit over the designed bowl or place series of fruits in the conveyor setup.

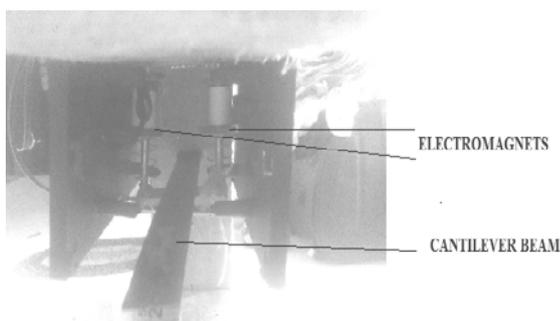


Fig. 4.2: Electromagnet placement

V. ELECTRONIC CIRCUITRY

Astable timer, these circuits are not stable in any state and switch outputs after predetermined time periods. The result of this is that the output is a continuous square/rectangular wave with the properties depending on values of external resistors and capacitors. Thus, while designing these circuits following parameters need to be determined:

1. Frequency (or the time period) of the wave.
2. The duty cycle of the wave.

The key external component of the astable timer is the capacitor. An astable multivibrator can be designed as shown in the circuit diagram (with typical component values) using IC 555, for a duty cycle of more than 50%. The corresponding voltage across the capacitor and voltage at output is also shown. The astable function is achieved by charging/discharging a capacitor through resistors connected, respectively, either to VCC or GND. Switching between the charging and discharging modes is handled by resistor divider R1-R3, two Comparators, and an RS Flip-Flop in IC 555. The upper or lower comparator simply generates a positive pulse if VC goes above 2/3 VCC or below 1/3 VCC. And these positive pulses either SET or RESET the Q output.

The time for charging C from 1/3 to 2/3 Vcc, i.e.,

$$\text{ON Time} = 0.693 (R_A + R_B) C$$

The time for discharging C from 2/3 to 1/3 Vcc, i.e.

$$\text{OFF Time} = 0.693 R_B . C$$

To get the total oscillation period, just add the two:

$$\begin{aligned} T_{osc} &= 0.693 . (R_A+R_B) . C + 0.693.(R_B) . C \\ &= 0.693 (R_A + 2R_B) . C \end{aligned}$$

Thus,

$$f_{osc} = 1/ T_{osc} = 1.44/(R_A + 2R_B) . C$$

$$\text{Duty cycle} = R_A+R_B/ R_A + 2R_B$$

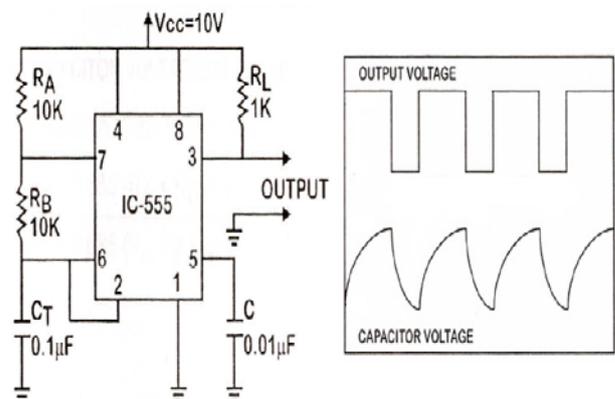


Fig. 5.1: Proposed system implementation

VI. EXPERIMENTAL RESULTS

To deseed the pomegranate it requires cutting the fruit and putting on net above conveyor belt. The hammering mechanism looses the seeds from pomegranate as per the hammering rate. If the rate is high for hammering then the deseeding will be faster and vice versa. Given in tables.

TABLE 1. HAMMERING RATE

S. No.	Hammering rate	Number of hammering per minute
1.	Low	20
2.	Medium	30
3.	High	40

VII. CONCLUSION

There are various methods to deseed pomegranate but are various factors limits to make perfect method. Here we tried to implement a simplest mechanism that can be applied for batch processing. This method gives an effective mechanism system with adjustable hammering speed or rate to deseed. It's a low cost system that can be used in small scale firms for pomegranate deseeding.

VIII. FUTURE SCOPES

The system can be implemented as a series of mechanism to process batches of pomegranate which can damage very low to seeds.

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