International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

DESIGN AND DEVELOPMENT PINEAPPLE PEELER AND CORING MACHINE

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Abstract – *Pineapple peeler and coring machine is a machine used to core and peel the pineapple to form the cylindrical shape pulp. As compared to conventional pineapple machine, this machine does all the process automatically. The main aim of this project is to develop a pineapple peeler and coring machine to solve the problems faced by Small and Medium Enterprise industries, where the machine developed can reduce the time taken for pineapple processed. In this project, the design of the pineapple peeler and coring machine has two cylindrical blades to remove the skin and mid core of the pineapple simultaneously. The advantages of this pineapple peeler and coring machine developed in this project are; it can cut the leaves and root of the pineapple, it can also peel off outer skin of the pineapple. Besides, it also can remove the core of the pineapple. In order to operate the machine, a pineapple is initially located at the machine holder. Then, the first cutter will cut the leaves and root of the pineapple. After that, the skin and the core of the pineapple will be removed by using two cylindrical blades. The PIC18F4520 MCU is the controller in this machine. It is used to control the whole operation in the Pineapple Peeler Machine and is interfaced with three pneumatic cylinders to run the machine. Critical aspects of this machine are the hygienic factor and the electrical and mechanical components.*

Keywords ***—Cutter, Pneumatic Cylinders, PIC18F4520 MCU, Peel and Core***

1. INTRODUCTION

The pineapple peeler and coring machine is a machine that automatically can cut and peel the pineapple to form a cylindrical shape pulp of pineapple. Pineapple pulp is the inner content of the pineapple between outer skin and core. The outer skin of pineapple is naturally hard and thick to cut. Pineapple core is the innermost portion or the central part of the pineapple. The core of pineapple is hard structure and tough. The automatic pineapple peeler and coring machine will peel the whole outer skin of pineapple and at the same time the core of the pineapple also will be removed. Pineapple pulp is used to produce juice, flavor, pineapple cocktail, pineapple jam and canned pineapple pulp. The main advantage of the automatic pineapple peeler and coring machine is the machine can process the pineapple with automatic operation. Automatic pineapple peeler and coring machine can done all the process required to produce the pineapple pulp, that means outer skin and core of the pineapple can be removed by the machine.

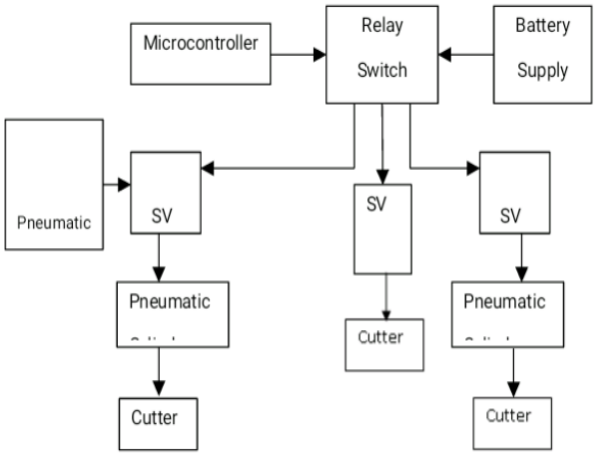
By using the automatic pineapple peeler and coring machine the production time and the labor cost can be reduced. The automatic pineapple peeler and coring machine can be used in the small and medium entrepreneurs (SME).

2. LITERATURE SURVEY

In the paper done by [1], the author presents the automatic pineapple peeler and coring machine. The machine has adjustable holder on the one side of pineapple to hold the fruit. The machine has two cylindrical blades to peel the skin and core the pineapple and a pair of magnetic switch to control up and down the peeler blade. The author uses power servo motor to drive the cylindrical peeler blade and the system is fully controlled by using microcontroller.

In the paper done by [2], the authors present the machine that is used for peeling fruits. The machine has pushrod, trident, grater, peeling blade, end cutting blade and safety cover. The function of pushrod is to hold the fruit and to push the fruit toward the trident. Trident is used to support the fruit and it will spin the fruit when the cutting process is carried out. Grater is a kind of blade used to grate fruit to make it look good. The peeling blade is used for peeling the skin of the fruit while a pair of end cutter is used for cutting the leaves and root of the fruit. The switch function is to control the process and the safety cover is used for protect the user while the machine operates.

3. CONSTRUCTION AND WORKING



In automatic pineapple peeler and coring machine, the machine has a pineapple holder. The machine has two cylindrical blades to peel the skin and core of pineapple and 5/2 solenoid valves to control up and down motion of the pineapple. In project three pneumatic cylinders are used to move pineapple for peeling operation through cutter and system is fully controlled by using PIC microcontroller.

3.1 CAM MODEL

Figure 3.1 shows the solid cam diagram and construction of pineapple peeling and coring machine.

Figure 3.2 shows the circuit of pneumatic cylinders consisting of 5/2 DCV's with solenoids.

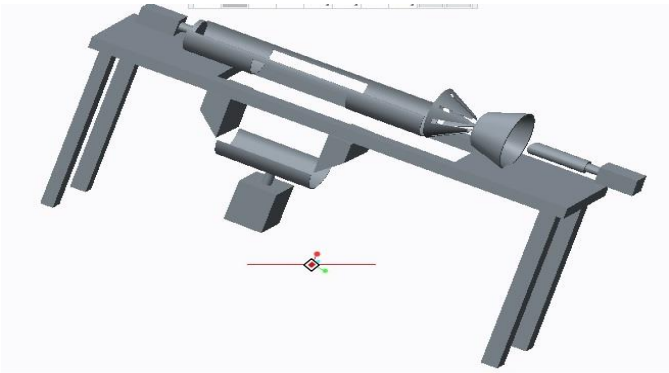


Fig 3.1. Solid Cam Diagram

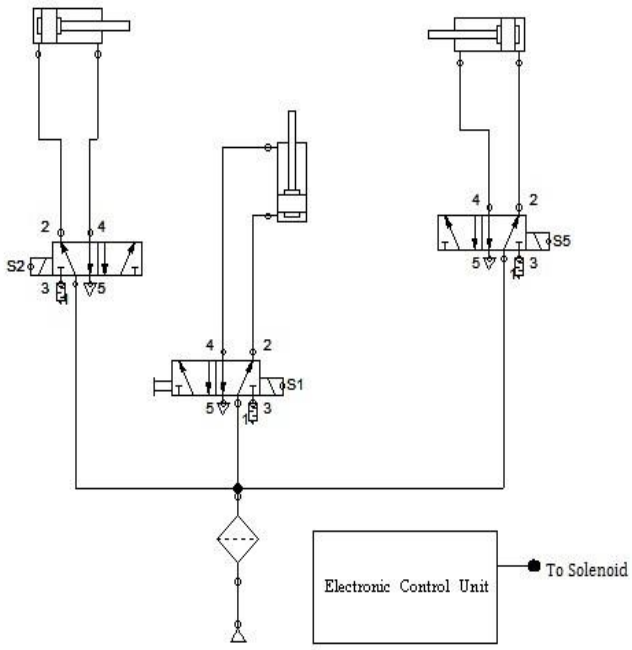


Fig 3.2 Pneumatic Circuit

4. DESIGN CALCULATIONS

4.1 Design of Cylinder:

Assume load for peeling and coring pineapple = 16 kg.

= 16×9.81

F = 156.96 N

Force = Area× Pressure

156.96=Area×0.118

(Pressure range of piston up to 10 bar assume min 1 bar)

Area=1330.169 mm^2

Diameter of the Piston (D)

$=\sqrt{(1330.169 \times 4)/\prod}$

Diameter of the Piston (D)

= 41.15mm

Thus consider the diameter of the Piston (D) =40 mm

Length of piston shaft:

Approach stroke = 130 mm

Length of threads = 2 x 20

= 40mm

Extra length due to front cover =8 mm

Extra length of accommodate head = 12 mm

Total length of the piston rod = 130 + 40 + 8 + 12

= 190 mm

By standardizing, length of the piston rod = 190 mm

Sr. No.	Parameters	Calculated	Standard
1	Piston Diameter	41.15	40
2	Stroke Length	190	200

5. RESULT

Since testing the pineapple peeler and coring machine it is observed that how much time is required to peel and core the pineapple by effective working. The detailed description is given below.

Loading i.e. placing the pineapple on the tray requires approximately 2-3 sec. The time required for upstroke is nearly about 2 sec. and the time required for actuating remaining two cylinders is also 2-3 sec. Thus, the total process time becomes 5-6 seconds. Considering machine economics i.e. interaction of human operator with machine, it is very easy to operate because the total system is automatically operated. Counting overall time let us assume that 1 pineapple takes 12 sec., so in 1 hour, 300 pineapples can be operated and in 8 hours, approx. 2400 pineapples can be operated.

5.1. Result Table:

NO	PARAMETER	RESULT
1	Loading and unloading time	5 sec
2	Operating time	6 sec
3	Total lead time required for single pineapple	11-12 sec
4	Number of pineapple in an hour	300 pineapples
5	Effective working of 8 hour (production rate)	2300-2400 pineapples

6. CONCLUSION

The redesigned peeler and corer described in this paper is very efficient, time saving, easy to operate and economical for the farmers. It process pineapple in very less time with low wastage and with improved efficiency compared to previous one. The wastage can be reduced even more by precisely adjusting the cylindrical blades. Approximately 300 pineapples can be processed in an hour by this machine.

7. REFERENCES

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