

# THE MANUFACTURE OF SUGARCANE PEELER AND SQUEEZER

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## ABSTRACT

*Sugarcane is one of Indonesia's agricultural commodities which is quite large in production, sugarcane processing in Indonesia is usually used as sugar and flavoring, but sugar cane is also used by the community as a raw material for beverages, namely sugarcane ice. Sugarcane grinding machines or sugarcane squeezer machines are using for the process of separating sugarcane juice from sugarcane stem fiber, with the help of a sugarcane squeezer machine it will produce a lot of sugarcane juice, and only requires a short working time. The use of a sugar cane squeezer machine for producing sugar and making ice cane with a small-scale machine, so that it does not require space and a complicated process, this machine is very suitable for small and medium scale sugarcane processing industry. The purpose of this research is to design and manufacture a sugarcane squeezer machine using a combustion engine. The implementation method in the manufacture of this machine uses a propulsion system including combustion motors, pulleys, v-belts, gears, shafts, pegs, rollers and bearings. The results obtained from the design and manufacture of this sugarcane squeezer machine are that the energy and time that have been used are more efficient and the sugarcane processing is faster than manually. The design specifications of the tool are 0.5Hp engine capacity, 220 volt voltage and 2500 rpm rotation. Testing of the sugarcane juice machine is carried out to find out the results of the design can function according to the expected design*

**Keywords :** Machines, Squeezer, Peeler, Sugarcane

## 1 INTRODUCTION

Sugarcane is one the world's best established industrial crops that is efficiently grown and harvested to produce both food and bio-energy. Peeling is the first process from harvest to processing which is a very important operation. The operation of sugarcane peeling has been investigated by many researches and studies such as: Sugarcane stems are collected from the field during harvest.

Sugarcane is a group of grasses that are widely used as the main raw material in the sugar industry. Indonesia with a tropical climate, it is very suitable for cultivating sugarcane (*Saccharum officinarum* L.) and sugarcane has a high sugar content in the stem (Ahmad, Ridhwan, & Ibrahim, 2016). Sugarcane is one of the commodities that can support the country's economy. Sugarcane stalks are also currently used as raw materials for other industries such as the chemical industry, animal feed, pharmaceuticals, mushrooms and fertilizers (Setiati, Wahyuningrum, Siregar, & Marhaendrajana, 2016). . Sugarcane cultivation is

recommended to prepare stock of sugar raw materials and improve economic welfare for sugarcane farmers (Yunitasari, Hakim, Juanda, & Nurmalina, 2015).

Sugarcane stalks that remain below the soil surface after felling can grow returned as crushed sugar cane. Reserve food for new shoots from sugar cane was originally supplied by the previous sugarcane root system. After those shoots grow into sugarcane stalks that have their own root system, then the old root function taken over by the new sugarcane root system. The old roots then change the color becomes dark (blackish) and is no longer effective in supplying food, so the roots eventually die and decompose in the soil (Syafriandi et al, 2015).

Sugarcane juice is the result of juice from sugar cane milling which is greenish brown in color. Sugarcane juice contains sugar, and other substances (non-sugar substances) with different sugar content influenced by the type of sugar cane, sugarcane age, climate, and maintenance methods (Irawan, Ginting, & Karo-Karo, 2015). Sucrose is formed from sugarcane juice through

the crushing process at the sugarcane chopper unit and squeezed at the milling unit. This process aims to facilitate the advanced stages of the process to the extraction process. The results of the extortion at the sugarcane milling unit are in the form of liquid and bagasse (Sulaiman & Hudan, 2018).

The existence of the sugarcane industry is also a job opportunity for the community around sugarcane plantations, thereby reducing the unemployment rate in Indonesia and increasing regional income so that innovation in the manufacture of sugarcane peelers and squeezers is needed to increase profits for MSMEs and the surrounding community.

Sugarcane plants is used in a wide range of beverage distributors as soft drinks by extortion process of sugarcane grinding machines. We often encounter sugarcane extortion machines used by small traders in crowded centers or on public streets. The squeezer machines used to manually process by hand to input the sugar canes into its machines. So that it becomes ineffective, increased the costs and energy of extortion processing. This becomes an obstacle that makes it ineffective and inefficient for (Sumarno, Buchori, & Carsoni, 2020).

The squeezer machines of sugarcane was used in squeezing the sugar cane to produce sugarcane juice. Generally the work system of the sugar cane squeezer machine is by inserting sugar cane into the roller several times until sugar cane juice is obtained. Sugarcane squeezer machines are divided into two based on the number of rollers, namely two rollers and three rollers. Each has advantages, namely the two-roller sugar cane squeezer machine is cheaper than the three-roller squeezer machine. While the weakness is that there is no place for sugar cane juice compared to using a three-roller squeezer machine that has a gap for sugarcane juice, but the price is more expensive than a two-roll squeezer machine (Sujito, 2012).

Its Generally that two-roller sugarcane press machines was designed by a driving motor to simplify and speed up the squeezing process so it can be produce more results than by using manual method sugarcane presses (Prasetya, Argo, & Nugroho, 2014). However, this machine has drawbacks where sugarcane production is still dirty because it is not equipped with a filter and reservoir (Doe & Lupito, 2016).

Because of that background, by conducting a research entitled, "Design and Manufacture of Sugarcane Stem Peeler and Squeezer". The purpose of the design and manufacture of this sugar cane squeezer machine is to reduce the energy and time that is too much from the usual sugar cane squeezer machine. the following specific objectives were studied are to developing an economical small-scale sugarcane peeling machine and to evaluate the performance of the

developed machine under the effects of the main design and operating parameters.

## 2. MATERIALS AND METHODS

The materials used in the manufacture of peeler and press machine cane stalks include:

- 1) Burning motor
- 2) Steel brush
- 3) V-belt
- 4) Pully
- 5) Measuring cup
- 6) Bearing
- 7) Elbows
- 8) Bolt nuts

The Design and Manufacture of Sugarcane Peeler and Squeezer Machine:

### 1) Tool Design

Design is one of the important stages in preparing a plan or program. This design aims to facilitate the manufacture of tools. The Design was defined as a process to describe the stages of a research plan involving various techniques and a detailed description of the components and constraints in the process (Nur & Suyuti, 2018).

The Manufacture of its sugar cane squeezer aims to get more efficient form. The main material used is the result of cut sugar cane (chopped sugar cane). Sugarcane flakes that enter the front roller will get pressure from the top mill roll, front mill roll and from the slicing knife on the tool. This pressure causes extortion to obtain sugarcane juice. The squeezed dregs were passed through the plate and into the second roller, resulting in compression between the top mill roll and the rear mill roll.

The sugarcane squeeze process is carried out by adjusting the distance between the upper and lower rollers. Sugarcane squeeze can be repeated several times until no more sugarcane juice comes out.

### 2) The Manufacture of sugarcane stalk peeler and squeezer

After the design data and design are ready, then the process of making this machine is carried out. The things that need to be considered at this stage are:

- a. Cuts the angle iron that will be made into a frame on the tool with the planned size, then shape it according to the frame design.
- b. Then carry out the welding process until it becomes a square frame or according to the design of the tool.
- c. Drills the angle iron to hold the machine and bolts so they don't slide off the aluminum plate easily.
- d. Install the sugar cane peeler and squeezer, then install the pulley on the shaft and combustion engine.

- e. Install the V-belt on the combustion engine pulley which is connected to the main shaft pulley.
- f. Finally did the test with the test material of sugarcane stalks.

- 5. Rollers
- 6. Bearings
- 7. Steel Brush
- 8. Shaft
- 9. Frame

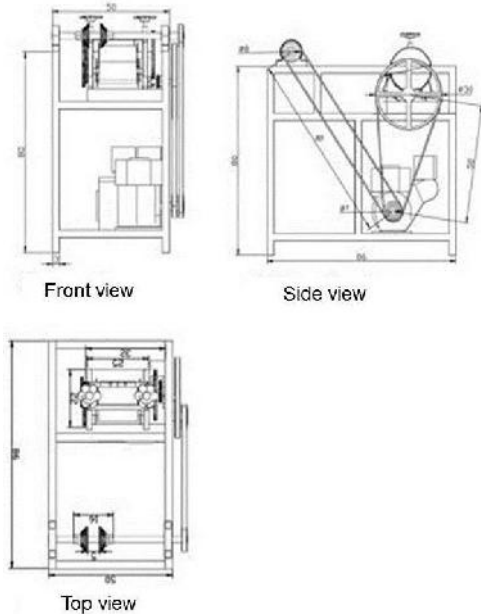


Figure 1. Sugarcane Barrel Peeling and Squeezing Machine Design

3. RESULTS AND DISCUSSION

3.1 The Research Results

3.1.1 Design

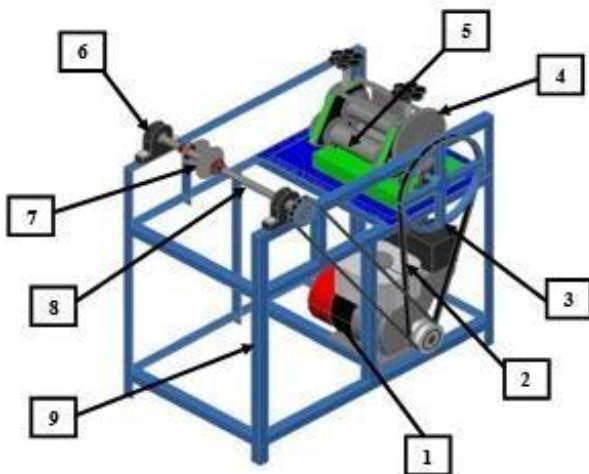


Figure 2. Sugarcane Peeling and Squeezing Machine

- Caption for figure 2:
- 1. Combustion motor
  - 2. V-belt
  - 3. Pulley
  - 4. Gears

3.1.2 The Peeling And Squeezing of Sugarcane Machines Specification

The design of the peeling and squeezing machine that reaches the making of working drawings with the design specifications of the tool is a machine capacity of 0.5 hp, a voltage of 220 volts, velocity of 2500 rpm and general specifications of machines as follows:

Table 1. The Parts of Sugarcane Peeler and Squeezer Machines

No	Part of Machine	Sizes
1	Combustion Engine	0,5 hp
2	V-Belt	L : 169 cm
3	Pulley	Diameter : 30 cm
4	Gear	Diameter : 22 cm
5	Roller	25 cm
6	Bearing	Jari-jari : 8 cm
7	Steel Brush	Jari-jari : 8 cm
8	Shaft	50 cm
9	Frame Dimension	86 x 50 x 80 cm



Figure 3. Sugarcane Peeler and Squeezer

3.1.3 Tool Work

- a) Cleans the sugar cane with the peeler machine in front of the sugarcane squeezer machine until the sugar cane skin is clean, after cleaning the sugar cane is then put into the squeezer machine with a little hand push, put the sugar cane into the squeezer machine 2 to 3 times to remove all the juice from the stem. The sugarcane juice falls into the water filter

which is located at the bottom of the squeezer machines.

- b) The Rollers that are made to have fine teeth, gears and levers as players are specially made so that the sugarcane stalks can move more easily with the teeth and do not slip or slip, while the gears are made a little higher on the teeth to allow for squeeze settings, it main will driving the component rod-shaped lever or round like a wheel.

### 3.1.4 Test Results

From the results of the tests carried out, it can be seen the length of time by stripping and squeezing the sugar cane stems with a length of 1 meter of sugar cane. The data taken from the test results are as follows.

**Table 2.** The Results of Stripping and Squeezing Sugarcane with a motor drive

No.	Quantity	Time (s)	Product (ml)
1	1 sticks	110	400
2	2 sticks	215	800
3	3 sticks	324	1230

**Table 3.** Results of Stripping and Squeezing Sugarcane Traditional Machines

No.	Quantity	Time (s)	Product (ml)
1	1 sticks	152	400
2	2 sticks	257	800
3	3 sticks	381	1230

### 3.2 Discussion

Based on the results of the study obtained a comparison of the time between the manual process and the process using a motor-driven machine. The results show that in the process of stripping and squeezing sugarcane with a machine for squeezing 1 cane it takes 110 seconds, then for squeezing 2 sugarcane it takes 215 seconds, then for 3 sticks it takes 324 seconds. but in the process of stripping and squeezing sugarcane manually for 1 sugar cane it takes 152 seconds, for 2 sugar cane it takes 257 seconds, and for 3 sugar cane it takes 381 seconds.

The results illustrated that the sugarcane stem should be peeled by the machine and squeezed by the roller due to their high product yields and shorter process time.

## 4. CONCLUSION

From the manufacture of a sugar cane peeler and squeezer using a 0.5 HP fuel motor, it can be

concluded that a sugarcane squeezer machine using a two-jagged mechanical roll produces a more optimal juice because it is faster than peeling and squeezing sugarcane stalks manually. In addition, the use of a sugar cane peeler and squeezer are more efficient than commonly machines.

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