

Engineering of Citrus Squeezer and Splitting Machine with Continuous System

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Abstract: This article is the result of research that produces prototype of splitting machine and citrus fruit extractor that capable of empowering citrus farmer community in order to manage tangerine crop not only in the form of fresh fruit but can diversify the product for processing citrus fruit juice, because during the time of harvest high prices tend to decline due to over production as well as many citrus fruits damaged by unsold. Market constraints are also influenced by the quality of local citrus whose quality is lower than imported oranges, so one solution is the diversification of products in the form of citrus fruit juice or fresh drinks. While the specific purpose of this research is to manufacture a package of machine technology divider and squeeze of tangerine fruit for consumption of fresh fruit juice or raw material processing citrus fruit juice. The design approach for designing this machine is done through several stages, among others; Literature review and field, basic data collection and analysis, Design and testing. Stages of making this machine design refers to the methods compiled by Gerhardt Pahl and Wolfgang Beitz are described in the book Engineering Design. The tests include structural and functional testing at the Laboratory. After doing the field test; adaptation test, functional, and verification. Then for the improvement made the modifications and re-testing. The output of this research is package of technology of splitting machine and orange squeezer for making syrup to maintain and increase the local tangerine fruit. The machine adds the technology capacity for fresh citrus fruit juice, in the hope that it can function well and efficiently for fruit juice production or manufacture of orange extract in a small-scale industry and affordable for citrus farmers. In addition, strengthen the community empowerment in citrus center areas that currently rely solely on sales in the form of fresh fruit.

Keywords: machines, splitters, squeezer, citrus fruits, continuous, diversified.

1. Introduction

Orange is a source of nutrition, especially vitamins and fiber that is needed by humans. Although vitamin requirement is relatively small compared to carbohydrate or protein, but vitamin deficiency in the body can cause various diseases. Therefore, eating fruits regularly will make the body healthier because vitamin C is usually dominant in citrus fruit that has the ability to increase endurance.

At the time of the harvest of citrus fruits are abundant and tend to decrease orange prices, so it needs to diversify the processing of citrus fruit juice. This can extend the shelf life of the product and increase the added value of the economy. Constraints that many faced in the processing of orange juice on a small scale industry is the limited technology in the process of extortion is efficient and affordable, so the prototype splitting machine and citrus fruit extract produced from this study is expected to help small industries in the process of orange juice squeeze for consumption of fresh juice or subsequent processing.

2. Literatur View

Olaniyan AM [5], explain that a small scale motorized orange juice extractor was designed and fabricated, using locally-available construction materials. The essential components of the machine include feeding hopper, top cover, worm shaft, juice sieve, juice collector, waste outlet, transmission belt, main frame, pulleys and bearings. In operation, the worm shaft conveys, crushes, presses and squeezes the fruit to extract the juice. The juice extracted is filtered through the juice sieve into juice collector while the residual waste is discharged through waste outlet. Result showed that the average juice yield and juice extraction efficiency were 41.6 and 57.4%, respectively. Powered by a 2 hp electric motor, the machine has a capacity of 14 kg/h. With a machine cost of about \$100, it is affordable for small-scale citrus farmers in the rural communities.

Krivec J And A Frishman [4], explain that fruit juice bottled or stored for extended periods of time has fallen into disrepute with health conscious consumers because of the loss of nutritional value associated with processing, transport and storage. It has consequently become increasingly popular to sell freshly squeezed fruit juice, particularly orange juice. Juice extracting devices used for such purposes require the presence of an operator to assist in or at least supervise the delivery of items of fruit to a juice extractor. Fully automated operation is complicated by lack of uniformity in the size and shape of fruit to be squeezed (even in fruit graded according to size) and the attendant difficulty in ensuring delivery of fruit to a juice extractor without periodic block-ages.

France [1] explained that for the design of the tool needs to be described factors influencing factors. Harsokoesomo, H.D [2], explains every dimension of the material must be calculated its strength.. Kalpakjian, S. [3] explains that all components of the design are detailed in detail.

3. Methodology

The design approach for designing this machine is done through several stages, among others; Literature review and field, basic data collection and analysis, Design and testing. Stages of making this machine design refers to the methods compiled by Gerhardt Pahl and Wolfgang Beitz [6] which is described in the book Engineering Design, which includes problem identification, formulation and completion of ideas, selection of draft concepts, analysis and drawing of work drawings. The tests include structural and functional testing at the Laboratory. After doing the field test; adaptation test, functional, and verification. Then for the improvement made the modifications and re-testing.

4. Model of the machine

This splitting and squeezing machine works using a continuous press system. Orange is inserted into the hopper and then into the pressing room so that the pressing occurs. Orange juice flows through the hole contained at the bottom of the pressing chamber that is distributed to the container. While the dregs of the orange was wasted by the pressure of the press, so that the dregs of oranges are pushed out of the pressing runag. The rate of discharge of waste depends on the amount of pressure per yeng found at the exit pulp.

5. Result

Table 1: Test results

Observation	Orange Weight (kg)	Orange juice (kg)	leather waste (kg)	Juicewaste (kg)	Time		Work capacity (kg/jam)	Rendemen (%)
					Minut	Hour		
1	16	5,184	9,5	0,791	7,43	0,124	129	32,40
2	16	5,324	9,9	0,956	6,37	0,106	151	33,28
3	16	5,823	8,5	0,657	4,33	0,072	222	36,39
Average	16	5,444	9,3	0,801	6,04	0,100	160	34,03

Specifications of splitting machine and orange juice crackers that have been made are; Engine dimensions (1500 x 575 x 910) mm. Power source electric motor 1 HP, electric 1 phase. Motor rotation 1400 Rpm. Round crank 22.1 Rpm. Operator 1 person. Working capacity 160 kg / hour. Weight 89.5 kg. Round pulley reducer 1866,7 rpm. Round gear reducer 62.2 rpm.



Figure 1: Documentation of machine test results

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