

# Management and Manufacture of Natural Honey Processing Machines in Kapuas Hulu, West Kalimantan

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**ABSTRACT**---Honey is one of the potential non-timber forest product commodities that is found in the Kapuas Hulu district of West Kalimantan. Forest Honey is a superior product, where no less than 80 to 100 tons of pure forest honey are produced annually from this region. So to improve the quality of honey that meets the standards (SNI) it is necessary to develop a Honey Processing Machine. In general, natural honey produced by the community does not meet the standards, especially manure and water content that is still 30% (Standard max 20%). Making Natural Honey Processing Machine needs to be done to improve the quality of honey, namely by carrying out a filter (Filter) and the process of reducing water content through heating and vacuum (Evaporator), without reducing the mineral content of honey. The results show that with this machine honey yields are cleaner and the water content becomes 16% (according to the standard)

**Keywords**---Honey, Filter, Evaporator

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## I. INTRODUCTION

Indonesia is a country that has forests, which have the potential for natural honey. One area is the Kapuas Hulu district. Kapuas Hulu Regency is located in West Kalimantan Province, which is one of the potential forest honey producers. No less than 80 to 100 tons of pure forest honey are produced annually from this region. When talking about the quality of honey and its taste, Kalimantan forest honey is not inferior to Riau forest honey and Sumbwa Forest. One of the best honey producing areas in West Kalimantan is Kapuas Hulu, precisely in the Danau Sentarum region. In the Kapuas Hulu area, it is a natural habitat for wild forest bees because tropical rain forests still grow in this area. Honey in this region has quite good protein and nutrients, so forest honey is very good to be consumed by pregnant women, children, adolescents in their infancy, and parents.

In Kapuas Hulu, there are at least around 60 periau or groups of village-based hamlet or forest honey farmers whose territory is spread throughout Kapuas Hulu, especially along the Kapuas river and lakes located in the Danau Sentarum National Park area. The periau are incorporated in the Association's container. These associations include: APDS (Danau Sentarum Periau Association), APMB (Muara Belitung Association), APMP (Periau Mitra Penepian Association) and APBS (Periau Bunut Singkar Association). These associations aim to increase revenue forest honey farmers community, but still pay attention to several important aspects, namely production, marketing, organization, and the environment. To

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increase the production of honey with a standard quality, improvements must be made, namely changes in the processing of honey, among others: the separator machine between honeycomb or honey dung with the honey. Another machine is a machine to reduce the water content of honey, without damaging or reducing the content / composition of honey itself. By making this honey processing machine, it is hoped that honey farmers can increase their income.

## II. HONEY

The principle of development in the agro industry is that the products produced are safe for consumption that do not contain disease, are not physically, biologically or chemically contaminated. In the process of its products minimize waste and pay attention to security and work safety. One example is Honey product. According to the Indonesian National Standard (SNI) 01-3545-1994, honey is a sweet liquid produced by honey bees from various nectar sources. Nectar is a kind of liquid produced by plant nectar glands, rich in various forms of carbohydrates (3-87%), such as sucrose, fructose and glucose, containing little nitrogen compounds, such as amino acids, amides, amides, acids organic, vitamins, aromatic compounds and also minerals. Cooked honey contains 41.0% fructose, 35.0% glucose, 1.9% sucrose, 1.5% dextrin, 0.2% mineral, 17% water and other substances including 3.5% amino acids.

Honey generally looks fresh, in the form of thick liquid, not crystallized and brownish yellow, some types of honey have a greater tendency to crystallize compared to other types of honey. Almost all types of pure honey that have not undergone a heating process have a tendency to crystallize. This process takes place naturally due to glucose content in precipitated honey and highly saturated honey solution. This very saturated condition occurs because the glucose content in honey is high more than 70% to the water content of less than 20%. An alternative that must be done is to do the process of heating honey to dissolve the crystals that are formed.

Decreasing the water content of honey through direct heating can reduce water content and kill microbes (yeasts) that cause fermentation. Heating must be controlled, because if not it will actually reduce the quality of honey. Heating at temperatures above 40°C causes the diastase enzyme activity to decrease even at high temperatures causing the enzyme to die. Warming also causes damage to honey which is characterized by increasing HMF (Hydroxy Methyl Furfural) indicators that occur due to the degradation of honey sugar. Based on this, the alternative technique to reduce honey water content by minimizing honey damage is by evaporation. This technique is safer and does not cause the extinction of the diastase enzyme because this enzyme is very sensitive to changes in honey's temperature and acidity. Therefore, efforts to reduce the water content of honey is done by making a building to reduce the water content of honey consisting of a combination of impermeable rooms with evaporation systems.

Honey quality is a very important consideration for honey buyers (industry or importers). Because it is very important to note that honey must be pure, clean from dirt, for example flies, other insects, feathers and must be uniform.

Based on SNI 8664: 2018 Indonesian National Standard Honey National Standardization Agency, the honey quality standard that is good for consumption is as the following table.

Table 1. Honey Quality Standards

No	Jenis uji	Satuan	Persyaratan
1	Aktifitas enzim diastase, min.	DN	3
2	Hidroksimetilfurfural (HMF), maks.	mg/kg	50
3	Air, maks.	% b/b	22
4	Gula pereduksi (dihitung sebagai glukosa), min.	% b/b	65
5	Sukrosa, maks.	% b/b	5
6	Keasaman, maks.	ml NaOH 1 N/kg	50
7	Padatan yang tak larut dalam air, maks.	% b/b	0,5
8	Abu, maks.	% b/b	0,5
9	Cemaran logam Timbal (Pb), maks. Tembaga (Cu), maks.	mg/kg mg/kg	1,0 5,0
10	Cemaran arsen (As), maks.	mg/kg	0,5

### III. HONEY PROCESSING

1. Material preparation process by pouring honeycomb into Storage Tank, in this process heating at a certain temperature until honey melts, the capacity of this storage tank is 500 liters.

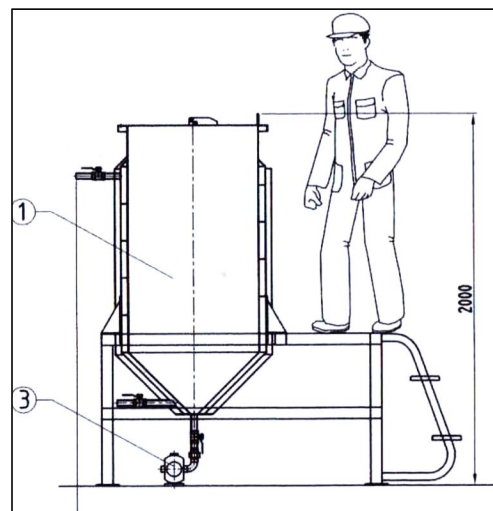


Fig.1 Storage Tank

2. The product (honeycomb) can be processed by using a Wax Press Machine to remove the liquid present in the honeycomb. Equipped with holding tanks with a capacity of 40 liters, motor drive, transfer pump drive and control panel.

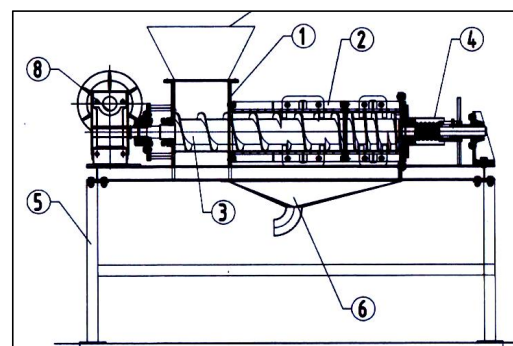


Fig.2. Wax Press Machine

3. The next process is the filtering or separation of particles needed in the filter machine. Equipped with a product transfer pump drive, heating element, chiller, water circulation pump and control panel.

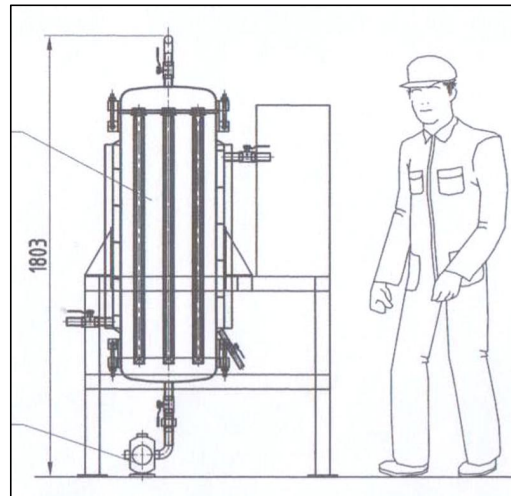


Fig.3. Filter Machine

4. After the screening is done, the honey will be accommodated in the Holding Tank for further processing. The capacity of the holding tank is 500 liters.

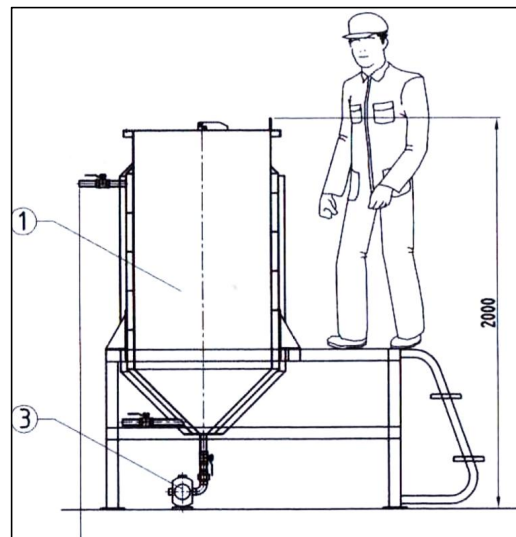


Fig.4. Holding Tank

5. In the Multi Purpose Evaporator machine the water content in honey will be reduced according to honey quality standards (the water content in honey). Equipped with a drive motor, vacuum drive motor, transfer pump drive, heating element, water circulation pump and control panel.

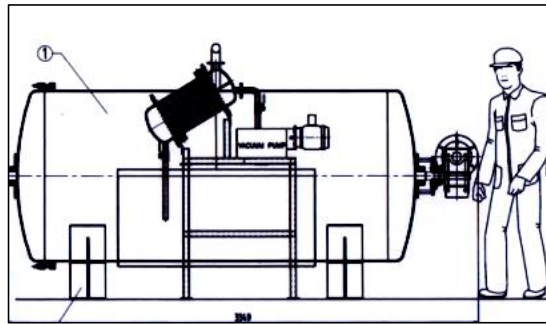


Fig.5. Evaporator

6. The final product in the form of honey and then packed using tools on the packaging machine (Filling Tank). Equipped with a stainless steel table.

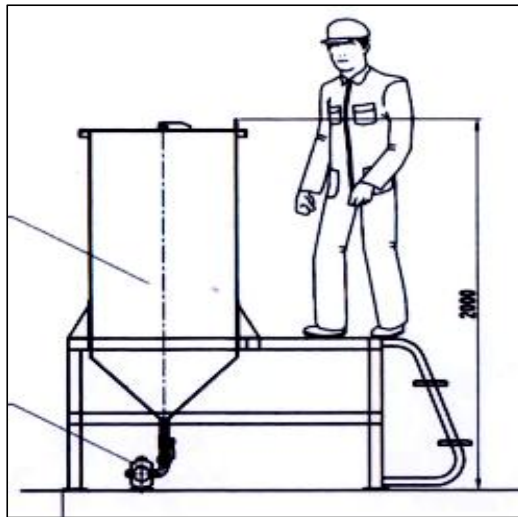


Fig.6. Filling Tank

7. Honey can be processed again in the Cream Machine to produce different products. Equipped with a motor, chiller, water circulation pump and control panel.

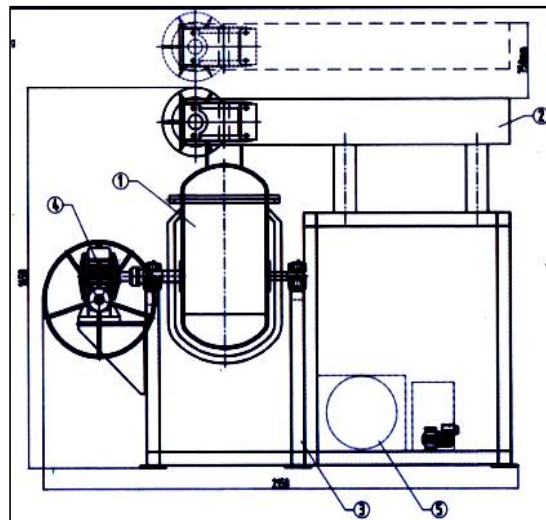


Fig.7. Cream Machine

8. The remaining material from the honeycomb squeeze process can be reheated / thawed in the remelting machine so that it can produce the final product in the form of wax / beeswax. Complete with heating elements, circulating water pump and control panel.

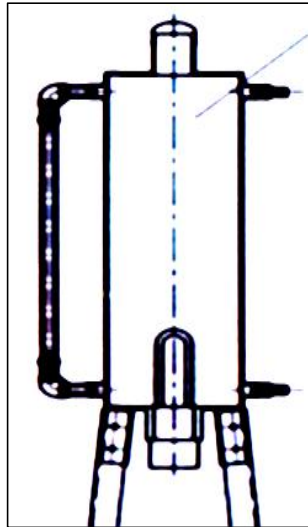


Fig.8. Remelting Machine

#### IV ACTIVITY PLAN

The Work Plan for Making Honey Processing Machines is as follows:

1. Material Preparation
2. Testing machines and equipment at the Workshop
3. Shipping recipient location.
4. Testing machines and equipment on site

Table 1. Activity Plan

No	Detail Job	Q'ty	Unit	M-I				M-II				M-III				M-IV				M-V				M-VI			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Material Preparation	1	Paket																								
2	Storage Tank	2	unit																								
3	Filter	1	unit																								
4	Holding Tang	2	unit																								
5	Evaporator	1	unit																								
6	Packaging	2	unit																								
7	Cream Machine	1	unit																								
8	Wax Press Machine	1	unit																								
9	Remelting	1	unit																								
10	Trial in Workshop	1	Paket																								
11	Delivery	1	Paket																								
12	On-site Trials	1	Paket																								

#### IV. RESULTS AND EVALUATION

The results of the process of making a Honey processing machine are as follows:

1. Storage Tank.

Specifications:

- 500 ltr tank capacity
- Material:
  - Contact 316L Stainless Steel products
  - Stainless Steel 304 platform
  - Double Jacket Stainless Steel 304
  - 304 Stainless Steel Piping
- Finishing: Chemical Cleaner and Paint



Fig. 9. Storage Tank

2. Filter.

Specifications:

- 270 mesh size
- 316 L Stainless Steel Tank
- Material:
  - Stainless Steel Double Jacket 304
  - Stainless Steel 304 Input Piping
  - 304 Stainless Steel Hot Water Tanks
  - 304 Stainless Steel Cold Water Tanks
  - Mild Steel Platform
- Pump: Gear Motor 1.5 Hp 4 P 3 Phase
- Heating Element: 3600 watts
- Chiller: 2 HP

- Water Circulation Pump: 125 watts
- Finishing: Chemical Cleaner and Paint
- Control: Control panel

### 3. Evaporator

Specifications:

- 2500 ltr tank capacity
- Material:
  - 316L stainless steel tank
  - 304 stainless steel condensor
  - Double Jacket stainless steel
  - 304 stainless steel input piping
  - Disc Strirrer Ø 1100 mm 316L Stainless Steel
  - 304 Stainless Hot Water Tanks
  - Mild Steel Platform
- Drive Motor: 15 Hp 4P 3 Phase Gear Motor
- Vacuum Driving Motors: Electric Motor 2 Hp 2P 3 Phase and Capacity 30 m<sup>3</sup> / hour
- Transfer Pump Drive: 1.5 Hp 4P 3 Phase Gear Motor
- 3600 watt heating element
- 125 watt water circulation pump
- Finishing: Chemical Cleaner and Paint
- Control: Control panel



Fig. 10. Evaporator



#### 4. Packaging (Filling Tank)

- 500 ltr tank capacity
- Material:
  - 316L stainless steel tank
  - 304 stainless steel piping
  - Mild Steel Platform
- Multi output filling
- Manual Labeling
- Equipped: Stainless steel table
- Finishing: Chemical Cleaner and Paint

#### 5. Cream machine

- 50 ltr tank capacity
- Material:
  - 316L stainless steel tank
  - 304 stainless steel Double Jacket
  - 316 stainless steel stirrer
  - 304 Stainless Steel Water Tank
  - Mild Steel Platform
- Drive Motor: Gear motor 7.5 HP 4 P 3 Phase.
- Chiller 2 HP 125 watt water Circulation Pump
- Finishing: Chemical Cleaner and Paint
- Control: Control Panel



Fig. 11. Cream machine

#### 6. Wax Press Machine

- Tank Holding Capacity of 40 liters

- Material:
  - 304 stainless steel hopper
  - Holding stainless steel tank 304
  - 304 stainless steel piping
  - Mild Steel Platform
- Drive Motor: Gear motor 7.5 HP 4 P 3 Phase
- Transfer Pump Drive: Gear Motor 0.5 HP 4 P 3 phase
- Finishing: Chemical Cleaner and Paint
- Control: Control Panel



Fig. 12. Wax Press Machine

To ensure that all tools / machines are able to function properly, it is necessary to conduct a test at the same time commissioning. Commissioning is carried out in several stages:

1. Complete machinery and tools
2. Dimensions and materials used.
3. Function, all tools and machines can function
4. System, all tools and machines can be well integrated.
5. Products, products produced according to standards



Fig. 13. Evaluation



Fig. 14. Commissioning

From the results of the evaluation and commissioning, it was found that all material and equipment used for the honey processing were in accordance with the required standards. All machines functioning properly can improve the quality of honey:

1. Honey is cleaner
2. Water content from 40% (before processing) is reduced to 16% (standard max 20%)

## V. CONCLUSION

Honey processing machines that are made can help improve the quality of natural honey, which can reduce the water content to 16% (max 20% standard) and honey to be cleaner, without reducing / damaging natural ingredients, such as sucrose, fructose and glucose, containing few compounds nitrogen compounds, such as amino acids, amides, organic acids, vitamins, aromatic compounds and also minerals.

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