

The Effectiveness of Coffee Bean Processing Machines in the Rezeki Farmers Group in Takengon, Central Aceh

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ABSTRACT-- *The appropriate technology program in the Community Service Scheme of Science and Technology for the community entitled "Effectiveness of Coffee Bean Processing Machines in the Rezeki Farmers Group in Takengon, Central Aceh" is to assist partner communities in efforts to improve UD Rezeki Group productivity through the application of appropriate technology and training in product diversification skills. coffee preparations. The method in implementing the Community Service Program consists of three activities, namely (1) making Coffee Roasting machines, flour and packaging, (2) training in processing skills for types of coffee beans, Arabica and Robusta and (3) Coffee Packaging Systems. The purpose of this Coffee Grinder Machine Design activity can facilitate the work in large-scale coffee milling. The methods taken in this design include: the survey stage, the planning stage, the implementation phase, post-construction and report making. Through engine performance test results obtained as follows: **70-watt** wiper motor capable of rotating a load of 10 kg with a 72 rpm rotational speed. Gear transmission can reduce rotation from 180 rpm to 72 rpm. The temperature control unit can regulate temperatures from 500 C to 2500 C, while the rotation speed control unit can set the speed from 10 rpm to 72 rpm.*

Keywords— *Design, coffee roasting machine, 10 Kg capacity*

I. INTRODUCTION

The current economic condition is in a state of economic crisis, the current economic crisis is very influential in terms of the economic life of the community, so that people are very difficult to meet their needs, resulting in low economic life of the community and it is very alarming. In addition, where the production of large companies also declined, many companies also stopped producing because the company could no longer produce large quantities and many companies went bankrupt / bankruptcy resulting in the termination of employees / commonly referred to as layoffs (employment terminations) thus increasing unemployment everywhere and especially in my own area due to the difficulty of finding work again. Given the importance of economic changes in society today, the community is demanded to be more enthusiastic and try again to achieve a job and experience better changes

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to meet their own lives, family, and to help others who are experiencing difficulties. Not only these factors but also the people today must be more creative in finding work.

Takengon Regency is an agrarian area, there is still a lot of agricultural land and the agricultural land is widely used to grow coffee trees because the land conditions are very suitable for planting coffee trees, but coffee is not a basic need in my area so when they harvest they are confused about selling coffee where this is, I am increasingly concerned about such conditions, because it is the only agricultural land that they can make as their livelihood. By looking at such conditions I will make an effort that can certainly help the difficulties that are happening in Takengon, especially in Blang Kolak 1 village, namely by helping people who have coffee bean processing and also helping people who do not have jobs. I will make a way of processing coffee beans and packaging them, with that way coffee traders will no longer be confused to sell to supermarkets, supermarkets nearby, even selling to the national and international level by making this packaging, I can also attract workers so that unemployment can be reduced. At this time many people who want to be practical in all drinks. Therefore I will make this coffee packaging with a different making so that people who like to drink this coffee do not feel bored because many people who like drinks, especially this coffee, then I will try to provide good quality and the price is relatively cheap for all society.

II. RESEARCH METHODOLOGY

To help overcome the problems faced by the small household industry "UD REZEKI" in the effort to produce coffee as a superior product for partners in the Applying Appropriate Technology to the community program, several problem solving methods were chosen, as follows.

a. Machine Design and Manufacturing Methods

The design process is the first step in the work of making roasted coffee machines for the application of Appropriate Technology to the community (PPTTG). Based on the results of the design, it can be known the dimensions of the machine, the amount of material requirements, the engine power plan, the machine productivity plan, and other problems related to the engine manufacturing plan.

Based on the results of the design drawings, continued with the procurement of equipment (coffee roasting machines, pulverizing and packaging) in accordance with the absolute design must be carried out to support the success of all plans for the application of Appropriate Technology Application to the community (PPTTG). In addition, the procurement of equipment in the form of a sangria coffee machine, powder and packaging will gradually help greatly in solving the problems faced by the small household industry "UD REZEKI" in Kampung Ulu Nuwih Village, Bebesen District, Central Aceh District, Aceh Province in order to develop its business.

b. Theory and Lecture Methods

The theoretical method and lecture were chosen to convey several supporting theories which are closely related to the problem of the use of the Roasted Coffee machine, the sculpting and packaging and the roasting process. Problems presented in this method, such as:

- (1) determine the size of the sangria coffee machine that is suitable for small home industries,
- (2) the technique of operating a roasted machine, and
- (3) how to maintain occupational safety and health (K3) in using the freying vacuum frying machine.

c. Method of Exercise / Practice

This method aims to equip the skills of training and home industry operators in "UD REZEKI" as a small-scale industry partner (partner) in the implementation of the Program for Applying Appropriate Technology to the community (PPTTG). The training and practice in this program are specific to the techniques of operating a coffee sangria and flour machine, how to maintain occupational safety and health in using the machine, and the roasting technique

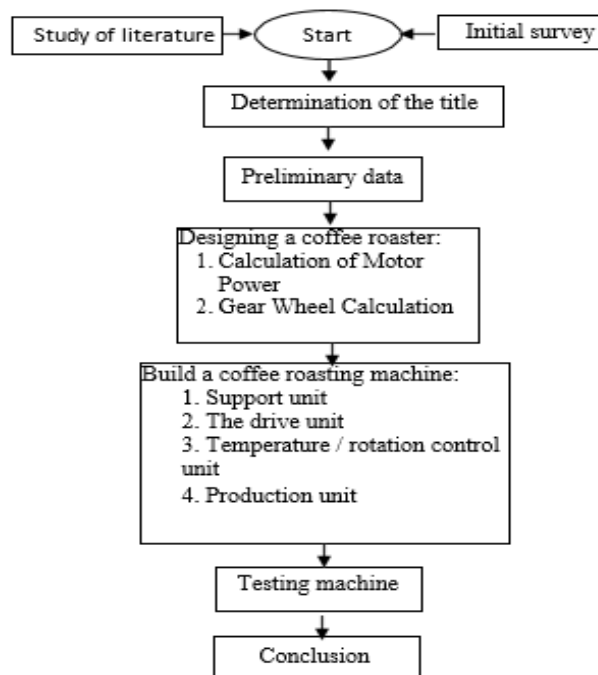


Figure 1: Desain test process

Figure 1 shows Engine Component Design Design Before making a semi-automatic coffee roasting machine in a workshop, we need to design the machine components. Such as buffer components, driving components, production units and control components. The component design was created using Inventor 2014 software. The image below is a design of several components in a semi-automatic coffee roasting machine.

The design of this semi-automatic coffee roasting machine will work when the motor is electrified so the motor will rotate the existing small gears, then will move the large gears on the shaft of the production unit to rotate the production unit so that it can roast coffee evenly and the temperature control system on roasting machine will regulate the temperature so that the coffee stays cooked evenly. After passing the roasting stage, the coffee will fall into the drainage section.

This drive component functions to rotate and start the roasting machine, the drive component consists of drive. Transmission and production units.

The production unit is a coffee roasting area, in the roasting tube there is a stirrer which functions to flatten the coffee maturity during the roasting process.

Preparation and Manufacturing Equipment

In the manufacturing process required preparation of manufacturing equipment for assemblers of semi-automatic coffee roasting machines to match their functions, for the preparation of equipment adapted to the type of production of each component.

III. RESULTS AND DISCUSSIONS**a. Torque Calculation**

Based on preliminary data obtained, the calculation of torque and engine speed will be planned.

Known :

$$F = 16 \text{ kg}$$

$$L = 6 \text{ cm}$$

$$T = ?$$

$$T = F \times L$$

$$T = 16 \text{ kg} \times 6 \text{ cm}$$

$$T = 96 \text{ kg cm}$$

b. Calculation of Power and Motor Selection

Researchers design the rotational speed of a semi-automatic coffee roaster machine is 60 rpm.

Known :

$$N = 60 \text{ (rpm)}$$

$$T = 96 \text{ (kg.cm)} = 6.96 \text{ lb ft}$$

$$P = ?$$

$$P(\text{hp}) = \frac{N(\text{rpm})T(\text{lb} \cdot \text{ft})}{5252}$$

$$P(\text{hp}) = \frac{60(\text{rpm}) \cdot 6.96(\text{lb} \cdot \text{ft})}{5252}$$

$$P(\text{hp}) = 0,079 \text{ HP}$$

$$P(\text{hp}) = 0,079(\text{hp}) = 745,7(\text{watt} / \text{hp}) = 58,91 \text{ watt}$$

c. After transmission efficiency is known furthermore calculate the engine power benchmark.

Known :

= 1.0 (because looking for maximum power)

$$P = 58.91 \text{ watts} = 0.059 \text{ kw}$$

$$Pd = ?$$

$$Pd = P(3)$$

$$= 1.0 \times 0.059$$

$$= 0.059 \text{ kw} = 0.08 \text{ hp}$$

d. Torque Check

if the torque counts at 6.96 lb ft and the installed power is 0.09 hp.

$$T (lb\cdot ft) \propto \frac{P(hp)}{N (rpm)}$$

$$T (lb\cdot ft) \propto \frac{0,09(hp)}{60(rpm)}$$

$$T (lb\cdot ft) \approx 7,878 (lb\cdot ft)$$

e. Build a Semi-automatic Coffee Roasting Machine

In constructing this machine, a manufacturing equipment is needed to facilitate the manufacturing process up to assembly.



Figure 2: Coffee Roaster Machine

f. How to make a coffee roaster:?

- Create a production unit to determine machine capacity
- Making the machine frame adapted to the size of the production unit
- Making the production tube cover
- Installing Transmissions (motors, reducers and gears)
- Install a temperature control system and putran
- Install all components to the frame that has been bolted like: stove, LPJ gas channel, hopper etc.

The community service activities through PPTG generally aim to create new jobs, especially for new business groups in Blang Kolak 1 village, Bebesen Sub-district, Central Aceh District, so that the income of poor households increases and can even be separated from poverty that has been shackling them. The target of science and technology activities for the community are as follows:

1. To increase the skills of coffee traders in making various types of processed coffee that are fast, easy, tasty and inexpensive with attractive and hygienic packaging. The processed coffee products that will be produced are the types of Arabica coffee that is packaged, and Robusta coffee.

2. To add insight into coffee powder sellers in applying marketing strategies through product strategies, pricing strategies, distribution / place strategies and promotion strategies for various coffee beverage products (mainly for arabica coffee).

3. To assist sales in the business group in preparing a business plan for coffee drinks (and for Robusta coffee),

4. To assist coffee farmers who are members of a business group in expanding the marketing of various types of coffee made in Blang Kolak Village 1, Bebesen District, Central Aceh Regency,

5. The compilation of business management and marketing strategies for various types of processed coffee in Blang Kolak Village 1, Bebesen District, Central Aceh Regency.

6. The social and economic activities of Blang Kolak 1 Village, Bebesen Subdistrict, Central Aceh District, especially coffee entrepreneurs are becoming more qualified.

ROASTEDPROCESS

The degree of maturity of roasted coffee is generally divided into three levels, i.e. In the process of roasting coffee occurs in two sequential stages. This fluidizing model roaster machine is designed when it has reached the time limit of the roaster, will turn off the heat source and automatically the air that blows to roast the coffee. The temperature profile readings during the roasting and tempering process can be seen in Figures 3, and 4. The effectiveness of this roasted machine performance, with the types of Arabica and Robusta coffee at the same temperature profile, only differ according to the degree of maturity determined by the process temperature, while the roasting time and tem-

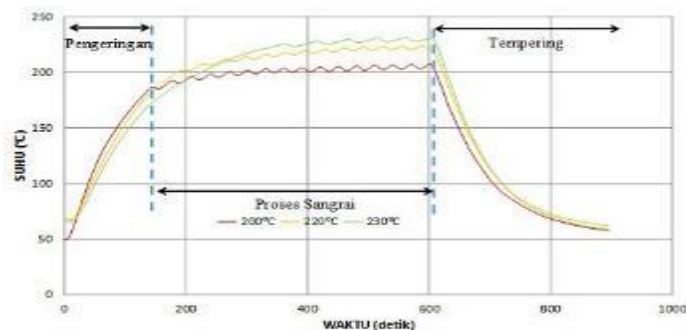


Figure 3: Process temperature type of Arabica coffee with light degree maturity (200 ° C), medium (220 ° C) and dark (230 ° C)

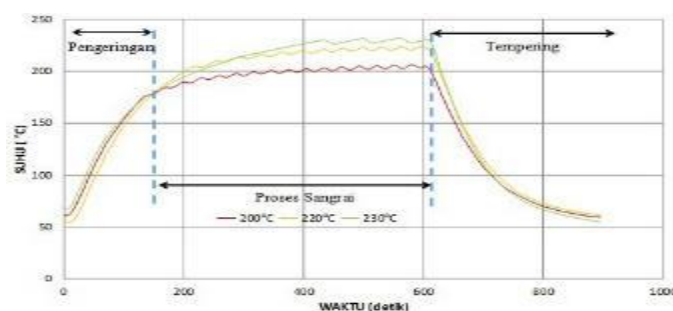


Figure 4: Process temperature type of Robusta coffee with light degree maturity (200 ° C), medium (220 ° C) and dark (230 ° C)

IV. CONCLUSION

The 10 kg coffee roasting machine test showed that the machine functioned well, the temperature measurement accuracy was quite good, the roasting results were evenly demonstrated by the consistency of roasting process from 2 types of Arabica and Robusta coffee, and 3 degrees of Light, Medium and Dark maturity. , all of them need the same 10 minutes of baking and 5 minutes of processing. Coffee roast machine test results produce activity above 80%. This shows that the processing process and post-harvest handling methods affect the activity of roasted coffee types. Roasted machine test results at the degree of light maturity produce taste test values above 80 for all types of coffee both arabica and robusta. But for Arabica coffee at all degrees of maturity it has a value above 80. In comparison *to the type of roasted machine*

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