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INSTALLATION OF PASTEURIZATION DAIRY CATTLE EQUIPMENT BASED ON BIOMASS ENERGY: WOOD SAW DUST BRIQUETTES

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ABSTRACT

Often the location of dairy cattle farms is far from KUD shelter/processing becomes a real obstacle to maintain the quality of milk from a review of health. Moreover, the problems of availability of non-renewable energy for small entrepreneurs is burdensome in terms of price. Potential utilization of the Tepas village becomes an important things to synergize between the workman of wood cutter and the farmers of dairy cattle. Therefore, this journal aims is to create a pasteurization tools fueled of woodsawdust briquettes. The first step is studying literature and field surveys which is used as a basis in designing the briquette molding equipment and hearth of pasteurization in the model of 2D / 3D CAD design. The next step is making dough of woodsawdust with adhesive starch and then pressed by briquettes molder. The briquettes which have finished is used as a heat source of pasteurization tube with LTLT (Low Temperature Long Time) methods to reach temperatures of 650°C within 30 minutes. Pasteurized milk can be stored at room temperature within safe 3 days which means could saving the transportation fuel around Rp. 740,000, - per month.

Keywords: Briquettes, Wood sawdust, pasteurization, CAD

INTRODUCTION

The historical study results of existing data stating that the financial business systems in Indonesia as big as 70% owned by the companies either engaged in industry nor services [1]. While the total number of large companies when compared with small and medium enterprises (SMEs) is very small. The crisis in Indonesia in 1998 prove that SMEs are able to survive to keep doing economic activity compared with large companies that experienced remarkable bankruptcies. Even at this time, the SMEs are able to be cantilever of the national economy, where is more independent and has simpler business system control[2].

Besides macro-economic issues, the Indonesian nation and even the world is currently faced to the problem of the availability of energy [3]. Non-renewable energy is getting longer implies dwindlingand definitely accompanied by the soaring price of fuel oil and gas that is difficult for the operational of SMEs. This is the basis for national and regional policy makers to start thinking about the potential of each village including the availability of unutilized energy that is cheap enough to lift the ability of SMEs to better compete with import products. One object of this study was the Tepas village, Sub Kesamben, Blitar district which is have topography of mountains. The natural conditions are very suitable for the business of wood logging and farming. Two of these efforts would be better if synergized to raise SMEs incomes. Those venture is a dairy cattle SMEs and SMEs of wood sawmills that produce sawdust of wood that is not utilized.

Wood sawdust used as raw material of briquettes which have a high heat. The heat generated in this study is used as energy to process pasteurized milk. then, briefly this activity will produce a design molder tools of briquettes and tools of pasteurization tube

with briquettes fuel. To complete this pioneer activities will be supported by economic assessment and the quality of milk produced.

LITERATURE REVIEW

Wood Sawdust Briquette

The potential of wood sawdust in Tepas village is immense, approximately 3m3 per day. these great potential heat energy from that wood dust is not completely utilized and only become a garbage that burned vainly. So in this paper will investigate how an equipment able to turn the wood sawdust into briquettes which more durable in generating heat energy process. Briquettes itself is a carbon fuel in a varied form that is produced of wasted organic materials as well as derivatives that still contain a certain amount of energy [4]. The use of sawdust as raw material in the briquettes is taken as there is wood carbon chain that was influential in the combustion process.

Sawdust taken in this study is derived from industrial waste wood that is thrown away without any sewage treatment optimally, so the waste can be recycled and reused. Briquetting of wood sawdust of teak and sengon using a very simple method for materials used within easy reach and obtained by the public. To get more optimal result, previous research conducted is using three variables, that is sawdust briquettes, sawdust briquettes that lubricated with oil, and sawdust briquette that lubricated with cooking oils [5].

Wood sawdust formed from organic substances such as cellulose, hemicellulose, lignin, pentosan, silica and the others substances. while the constituent elements are mostly composed by Carbon (C), Hydrogen (H), Nitrogen (N), Oxygen (O2), ash and the others elements [6]. Cellulose content is about 48.8935%, lignin content is 28.8977%, ash content is 2.09435%, water content is 6.015% and pentosan content is 14.09945% [6]. Lignin has a chemical bond with hemicellulose even it is recognize the existence of the bond between lignin and cellulose. That bond can be the type of ester or ether is proposed that the bond glycoside bond unifying and polysakarida. Chemical component in wood have important meaning, because it determines the usefulness also to know the type of wood, we can distinguish the type of wood.

The definition of briquettes itself is an ingredient in the form of powder or small pieces of wood that is compressed using a press machine that mixed with adhesive ingredient to make it a solid form. Biomass briquettes are an environmentally friendly alternative energy. The raw material of this briquettes powder are wastes of residual production, households wastes, farms or garbage of natural processes, such as dry leaves [7]. The type of briquettes classified into two major groups, namely coal briquette and biomass briquettes. Based on the raw material, biomass briquettes divided into several types, including:

1) Coconut shell briquettes.
2) Palm shells briquettes.
3) Wood/Sawdust briquettes.
4) Twigs and dry leaves briquettes, etc.

Based on previous research during the combustion process, briquettes with mixture viscous (more adhesive), looks burned slowly because the structures has a narrow cavities. While hollow briquettes (with slightly adhesive), looks burned faster because its density structures has larger cavities. On charcoal briquettes with mixture viscous when used directly for cooking, the charcoal can last longer (until become ashes). And if it is not directly used, the charcoal is not easily destroyed. While the charcoal briquettes mixture of 1 : 3 when used directly for cooking, charcoal does not last long (until become ashes). And if not used immediately, charcoal is easily destroyed.

Milk Pasteurization

Pasteurization is a process of heating milk at temperatures less than 100C and in a

certain period of time can turn off most of the microbial milk [8]. In addition intended to kill microbes disease-carrying (pathogens), such as the TB bacteria; Coli, etc., The process of pasteurization which followed by cooling immediately will able to inhibit the growth of microbes. It also prevents damage ensimatis system that resulting (eg phosphatase enzyme, lipase, etc.), so as to reduce the damage of nutrients and repair the storability of fresh milk. In general the method of pasteurization is divided into three kinds of levels seen by temperatures used. These three kinds of methods are as follows [9]:

1. LTLT (Low Temperature Long Time). LTLT method is basically carried out by heating the milk to a temperature 63-65^{0}C and maintained at that temperature for 30 minutes. The tool used to LTLT is like an open tank (open vat) with indirect heating or better known as "Batch Pasteuriser".
2. HTST (High Temperature Short Time). HTST method is being carried out by heating the milk for 15-16 seconds at a temperature of 76^{0}C or more by using a heat exchanger tools and followed by a milk cooling process quickly so that the microbes were still alive do not grow back.
3. UHT (Ultra High Temperature) Pasteurization. Further development of the technique of pasteurization is by using very high temperature heating (UHT). UHT pasteurization is a process of pasteurization is done at very high temperatures and a very short time, at a temperature of 131-150 ° C for 0.5 to 1 second. Heating is done with high pressure (High Pressasure) to prevent the milk burning heater. The products can stand at room temperature for up to several months if packaged properly.

REASEARH METODOLOGY

Broadly speaking, this paper is divided into two main parts, namely the manufacture of wood sawdust briquettes and heating the milk in the pasteurization process. Here are the steps taken to make the wood sawdust briquettes, such as:

1. Designing a sawdust dough mixer with adhesive material and press tool design. Figure 1a and b show the two main engines that produce sawdust briquettes.
2. Prepare the main ingredient briquetting, such as sawdust, starch and water.
3. Make briquettes base material dough start with inserts wood sawdust, then adhesive material (starch) and water into mixer. Comparison of the composition of the dough is 3 tablespoons of wood saws, 1 tablespoon of starch and 1/3 cup of water. Stir it until evenly mixed by rotating the lever stir within 2-3 minutes (Figure 1a).
4. Pour the dough to briquette press machine print, insert the dough until it is full then press the dough until solid (Figure 1b).
5. Pull out the result of pressing, and wet sawdust briquettes succeed in print.
6. The briquettes which still wet and then dried by drying for approximately two days. If there is no sun light, briquettes were still wet is settling enough for four days.
7. After the briquettes dry. The briquettes is ready to be used for pasteurization tube heating.

Figure 1a. Kneading machine sawdust briquettes and starch, b. Press tool sawdust into briquettes.

Whereas dairy cattle milk pasteurization process using LTLT (Low Temperature Long

Time). LTLT method is generally performed with the heating of milk to a temperature 63-65^{0}C and maintained at that temperature for 30 minutes. The tools used for LTLT is open tank (open vat) with indirect heating or better known as "Batch Pasteurizer". Figure 2a shows the design tool pasteurization / sterilization 3D cad along with furnace as the place for burning the briquettes of wood teak and wood sengon. The model in the picture is a simple model that has not been added thermostat, pressure gauge and other equipment. Furnace design is also the initial design, so as to give the possibility to design a more optimal transformation of the heat from furnace briquettes to pasteurization tool. Figure 2b shows the process of the pasteurization tube made from special stainless steel material for heating the milk with a thickness of 1 mm.

Figure 2. a. 3D design of tool pasteurization, b. Coordination the manufacture pasteurization tube fueled sawdust wood briquettes.

The step of performing on milk pasteurization process is as follows:

1. Prepare saw dust briquettes of wood that has been dried and ready to be turned on.
2. Prepare fresh milk results of the latest juice ready to be heated at a temperature of 65^{0}C for 30 minutes.
3. Insert the tube into pasteurized milk and heated with briquettes, temperature control to remain in the range of 65^{0}C to see continued temperature on the thermostat, if the temperatureis lessthen it should be added briquettes and vice versa.
4. Turn off the furnace briquettes after pasteurization lasted for 30 minutes.
5. Pour the hot milk into the place to do the cooling process.
6. Save pasteurized milk to be ready to send to KUD or for direct consumption. If cooled to room temperature, it will hold it for 3 days and when cooled in the refrigerator at a temperature of 80°C will hold for 1week.

RESULTS ANALYSIS INSTALLATION OF BRIQUETTES AND PASTEURIZATIONTOOL

Wood Saw dust Briquettes Results

Briquettes produced in dry conditions measuring 6 cm in diameter and 12 cm high with a weight of 0,05 Kg. Figure 3a is an example of the product of dry briquettes are ready for use as fuel. The drying process is highly dependent on natural weather, when scorching heat could in one day, whereas when all subjects will be dry and ready for use after settling for 5 days. Capable of fuel briquettes produced are for 21 minutes with the colored flame that produces a thin smoke. Resilience burn and smoke generated depends on the density and the level of dryness briquettes itself.

Figure 3.a. Results are ready in fuel briquettes, b. The pasteurization process with briquettes

Cost analysis is to know money spent to make the process of pasteurization and the sacrifice and reduce profit UKM. Cost analysis purposes, among others:

- To test the feasibility of the equipment used in terms of economic
- To determine the pricing strategy decision of cow dairy
- To plan a profit
- To calculate profit / loss

In briquette-making research, I use sawdust as basic ingredients. Because, in society environment sawdust not available as substitute for fuel oil. Meanwhile, sawdust is easy to obtain without any charge. The other basic ingredients to make charcoal briquette are dry leaves, pieces of woods, etc.

Briquettes cost analysis are in the form of adhesive material (*kanji*) taking charge of ⅓ kg at Rp 1.500,00. Labor cost, Rp 2.000,00/1 kg dry briquettes (content of 20 pieces). The sale price is Rp 6.000,00 to Rp 7.000,00 per kg of briquettes. Thus, the benefit will be Rp 2.500,00 to Rp 3.500,00/kg from the sale price. With notes: 1 kg briquettes (contents of 20 pieces)

Pasteurization Result with Briquettes

The process of briquettes burning for heating pasteurization milk show in Figure 3b. From the picture can be explained that to produce heating milk at temperature of about 65^0 C for 30 minutes takes amount of briquettes of 10 pieces for volume above 60 liters of milk. No need special control to keep the temperature, because the thermostat manual will give sign to the operator to control the fire.

While the benefits of pasteurization with briquettes are, beside the cost of fuel is cheaper also longer storability. Raw milk should be immediately sent to KUD collectors while pasteurization milk can last for 3 days. Thus, if the number of deliveries per day are twice and once shipping cost are one liter of fuel (Rp 7.400,00) then per day cost have to spend is Rp 29.600,- or Rp 888.000,00 per month. After pasteurization, the delivery become 3 days once or the cost of fuel will be Rp 148.000,00 per month. Therefore, it can save fuel cost at Rp 740.000,00. It also would be delivery labor-saving and time-saving.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the results of community service activities that have been done, it can be concluded some points as follows:

1. print tools of wood sawdust briquettes is very important to be used as a tool to process very complex briquetting, which involves several factors such as: the type of sawdust, wood powder moisture content, adhesive type and dimensions of briquettes itself.
2. Perpetuation has success to install the tool pasteurization fueled unused sawdust into briquettes which producing heat.
3. Based on the feasibility study on the economic side which regard to operational costs and sales cost of briquettes and pasteurized milk. Briquettes able to sell at a price Rp.6.000,00 per kg with a profit of Rp. 2500.00. The pasteurization process can reduce fuel transport costs Rp. 740,000.00 per month.

Improvement Suggestions

1. Need for assistance concerning the processing of milk ready to eat favored by market, marketing, due increasing production will affect the amount of product that must be deposited.
2. Evaluation to environmental conditions of milk producers work should be more hygienic to reduce complaints arised. Complaints from craftsmen are milk which produced usually fast to decay.
3. Need for quality control of heat which more stable to maintain the consistency of the quality level of the pasteurization process over time.

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