

## DESIGN AND MANUFACTURING OF BODYPACK PORTABLE MILK MACHINE WITH CAPACITY 5 LITERS

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### ABSTRACT

*The conventional milking process by cattle breeders in hilly areas is considered ineffective and requires a lot of energy due to steep terrain and far from road access. The aim of this research is to make a portable body type milking machine that can help farmers in the milking process. The data obtained were processed in a qualitative descriptive manner. The results showed that: (1) the stages of the study began with data collection, machine design, machine manufacturing, and performance testing; (2) performance test results show that the machine is very helpful for cattle farmers in the milk milking process.*

**Keywords:** *bodypack; milking machine; portable.*

### 1. INTRODUCTION

The process of milking milk globally in developed countries is done automatically, but in some developing countries this process is done manually / traditionally. [1]. In Indonesia, people generally consume cow's milk. Along with population growth, increased incomes, and changes in lifestyle, including diet, the consumption of cow's milk in Indonesia has increased from year to year. This can be seen by the ever increasing milk production and consumption from 6.8 liters / capita / year in 2005 to 7.7 liters / capita / year in 2008, or the equivalent of 25 g / capita / day [2]. Added by [3] Dairy products are important food products for health because of the contents contained therein. So that the dairy farming business makes the most important foundation in undergoing food security, therefore because the dairy farming business must be developed because it is able to maintain food security and

provide business opportunities for the community.

Pure milk is a liquid derived from healthy cows which is obtained by proper milking without reducing or adding any other components or ingredients [4]. In line with the opinion above, according to [5] argues milk is a livestock commodity which is mainly used in fulfilling national nutrition and food sources. Milk is produced from the normal secretion process in healthy cow udder and production from cow udder will be produced regularly through the birth cycle. Milk which is known as a rich source of nutrients has various contents in it, such as carbon dioxide, protein, fat, minerals and vitamins. The condition of milk which contains nutrients also gives growth to various types of bacteria, yeast, and mold. Milk composition consists of 83.3% water content, 3.2% protein, 4.3% fat, 3.5% carbohydrate, K 4.3 mg / 100 g, P 60 mg / 100 g, Ca 143.3 mg / 100g, Fe 1.7 mg / 100 g, Vitamin C 1 mg / 100

g, Vitamin B1 0.3 mg / 100 g and Vitamin A 130 (SI). Milk is also known to contain other components such as enzymes, pigments, and leukocytes [6].

Dairy cows are the main producer of milk for human consumption. The need for cow milk is now increasing, so milk production must also be increased. The processing of milk must be done hygienically so that the quality of the milk produced is guaranteed so that the milking, equipment, and handling processes must be carried out according to standards [7]. Equipment that can be used by breeders is a cow milk press machine. The milking machine is a machine used by breeders in helping the process of milking cows [8]. Cow milking machines have many types, but in general these machines are widely used by large-scale cattle farmers. Large-scale cow milking machines consist of a series of components used to milk 200 cows per hour. The system of a series of cow milking machines consists of air pumps, regulators (gauges), and pulsators. All components are integrated to distribute milk to the container which will then be processed into a product.

Cow milking machines have various types, but the price of cow milk press machines is quite expensive, ranging from Rp. 17 million to Rp. 25 million [8]. The observation team of researchers at the People's Farmers Center (SPR) Cinagarabogo Subang Regency in June-July 2018 that found several problems, namely: (1) breeders have not been able to buy a milking machine that is sold on the market now because the price is very expensive, (2) breeders find it difficult to operate a cow squeezer machine so that an easy machine is needed in its operation, (3) a cow milking machine is now considered to be less suitable for small-scale farmers because the machine requires a large and less effective place if farmers are used in mountainous areas. Based on the above problems, the research team is interested in making a milking machine through the process of design, manufacturing, and field trials. This

Collection through observation and study of literature. The research team conducted a survey of cow milking equipment at the center of pure cow milk in Lembang Regency. There the research team looked at the process of

milking machine is expected to help the milking process so that the production of cow's milk in the Subang Regency can increase significantly.

## 2. METHODS

Milking machine is a machine that helps the milking process in a semi-automatic system works [8]. According to the large Indonesian dictionary portable means easy to carry. Based on the explanation above, it can be concluded that the portable milking machine is a machine used to assist the milking process of cows and is easy to carry. A standard milking machine consists of a) Vacuum Pump b) Pulsator c) Milk claw d) Putting straws (Teat cup) and e). Milk bucket (Bucket).

The stages of this research are data collection, machine design, machine manufacturing, machine testing, and reporting results.

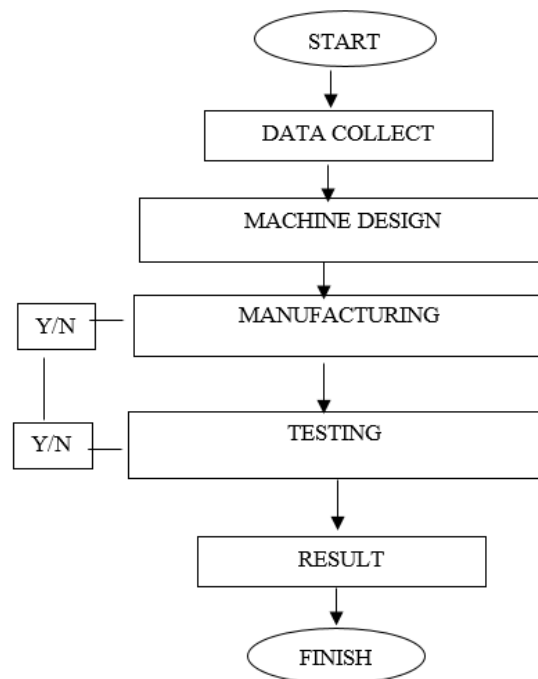


Figure 1. Research Flowchart

milking sapids and the types of tools used to do milking cows.

Literature study is carried out by reviewing various literature books relating to

the welding process. In addition, a more important study of literature is to examine published international and national scientific journals.

The design of portable milking machines uses the 2014 Autodesk Inventor application. The design is expected to be a research guide in designing and building portable milking machines. The results of the design in the form of engine drawings and components used.

Making a machine is a further step after the design has been validated by expert judgment, and the research team conducts the process of making the machine with the tools and materials prepared. After the machine is

finished, it is validated by expert judgment. The machine is tested for performance in the process of milking cows.

### 3. RESULT AND DISCUSSION

#### Machine Design

The design of portable cow milking machines uses the 2014 Autodesk Inventor application. Autodesk Inventor is software that generally has a concept of parametric type design [9]. The results of engine design are as follows:

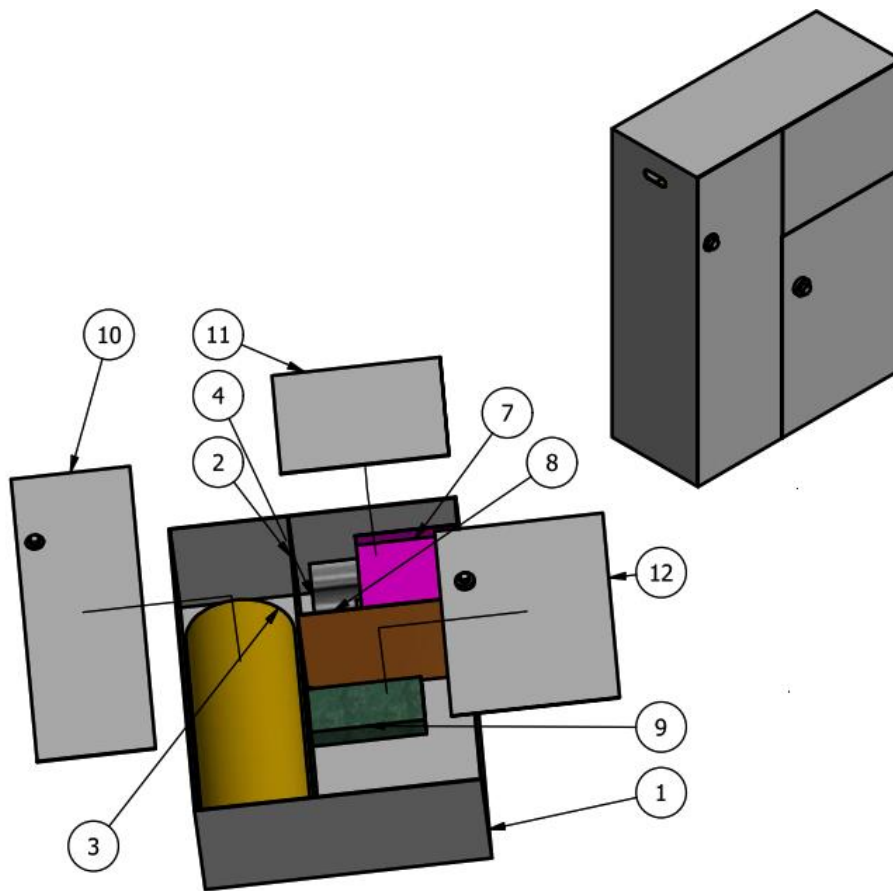


Figure 2. Machine Design

Cow milking equipment has 12 main components, namely: (1) frame; (2) partition 1; (3) bottles; (4) pumps; (5) spom pump bearings; (6) electro; (7) skating pumps; (8) insulation 2; (9) batteries; (10) gate-1; (11) gate-2; (13) gate-3.

#### Manufacturing Machine

Milking body pack model is a device used for milking with high mobility because it is very easy to carry kemanamana. The material used uses materials suitable for food and food grade drinks. The box is made of stainless, and the assembly is standard so that the quality of the milk obtained is guaranteed.

## Preparation of tools and K3, materials

### 1) Tools

- Electrodes
- Welding machine
- Wire brush
- Welding hammer
- Burrs and tools

### 2) K3 equipment

- Welding goggles
- Gloves
- Grinding glasses

### 3) Ingredients

- 304 Stainless Steel Plate 1.5mmx1220mmx2440mm
- Milk Claw 160 CC
- Mini Motor
- Pulsator 50-180 rpm
- Nylon Suction Hose 12mmx9 mm
- Food grade milk tubes of 5L capacity
- Bodypack 1000mmx500mmx300mm
- Vacuum Pump 1.4 HP

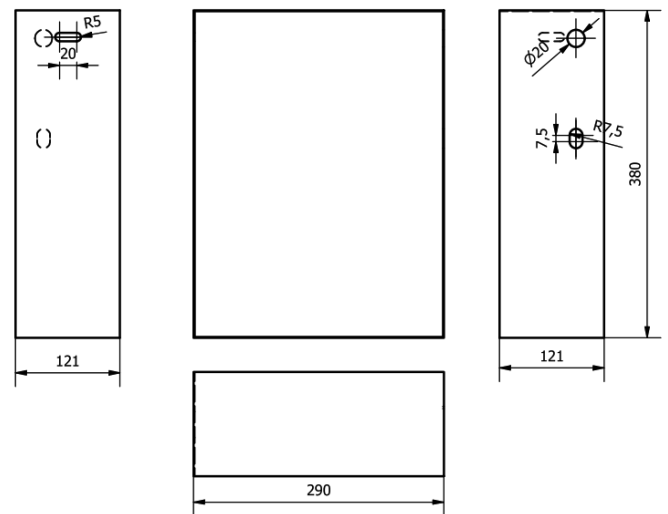
## Manufacturing

Box plate cutting is done in several stages. Plate-making must use occupational safety and health equipment to avoid accident [10].



**Figure 3.** Plate Cutting

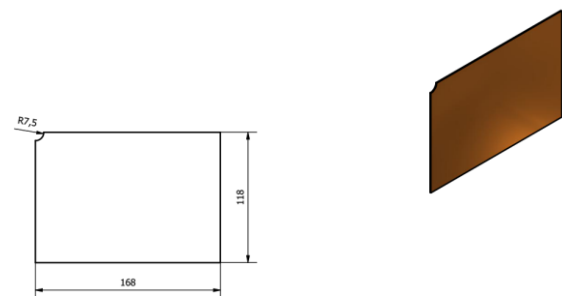
**The fabrication of the casing is adjusted to the following designs:**



**Figure 4.** Casing Manufacturing

From the picture above the frame casing is divided into 4 main sections cut in accordance with the image and welding process is carried out. Electrodes used specifically for stainless steel.

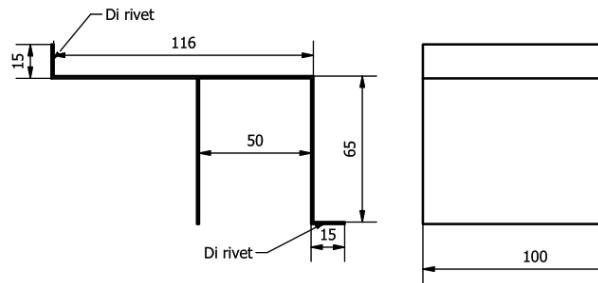
## Manufacture of insulation



**Figure 5.** Making of insulation

Making a central baffle by cutting process according to the drawing and grinding each end to eliminate sharpness after that in section R7.5 grinding is done, the part is used to place the channel from the pulsator to the milk tube.

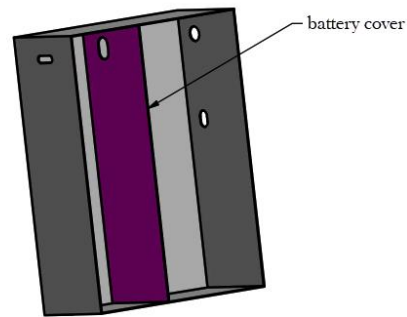
### Making skating pumps with pulsators



**Figure 6.** Making skating pumps

The process of making a pump skate made of stainless steel is cut using a hand grinding and folding and welding carried out on the skates, so that it becomes the shape as above.

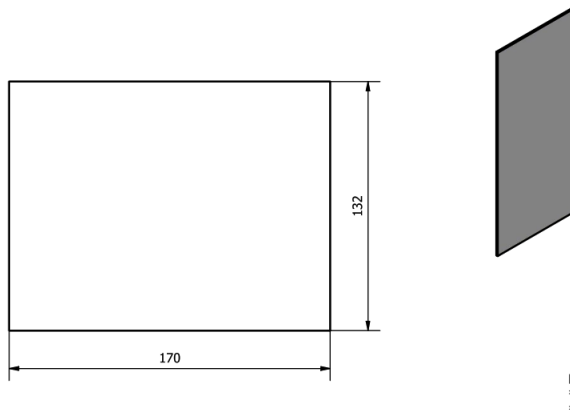
### Manufacture of battery cover doors and hoses



**Figure 8.** Making of battery cover

The process of making a door cover for the battery and suction hose is done by cutting using a hand grinder and adjusted to the dimensions of the working drawings

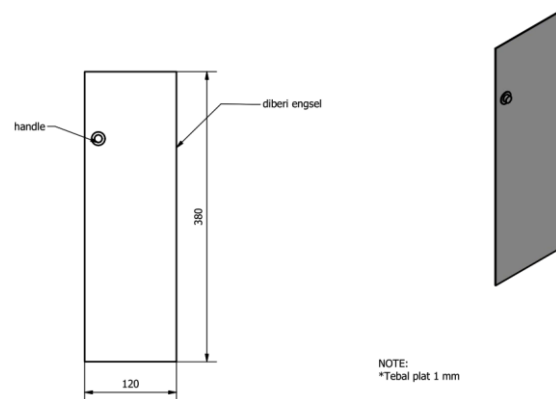
### Manufacture of pump and pulsator covers



**Picture 7.** Making Pulsator Cover

The manufacturing process is done by cutting using a hand grinding so as to produce dimensions and shapes like the picture above.

### Manufacture of milk canister / bottle cover doors



**Picture 9.** Making of Milk Canister

## Cows Milking Machine Assembly



**Figure 10.** Assembly Process

The assembly process uses and a number of other supporting equipment, the following is the assembly process in the manufacture of the milk type bodywork milking machine: (1) installation of insulating 1; (2) installation of insulating 2; (3) pump and pulsator installation; (4) installation of patent cover; (5) mounting the battery cover; (6) battery and hose installation; and (7) installation of the milk canister cover door.

### Finishing

Finishing inside the box includes checking and repairing the hose lines between the components and polishing each part that is in the box



**Figure 11.** Finishing



**Figure 12.** Milking Machine

### Testing

Testing is done at KPBSU (North Bandung Cow Farmers Cooperative), with the following testing stages:

- a. Testing is done in the afternoon around 16:00 WIB, this is done when the cows are ready to be milked.
- b. Remove the tool box and turn on the cow milking device by pressing the ON button, if necessary enter the electrical power directly. The test was carried out at KPBSU (Koperasi Peternak Sapi Bandung Utara).





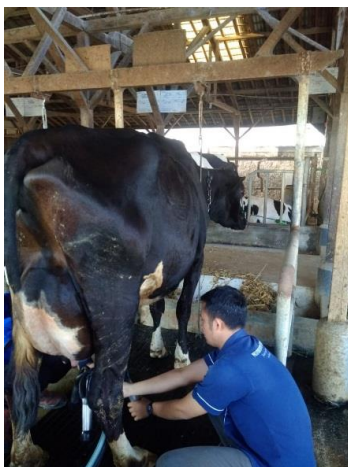
**Figure 13.** Prepare Testing

- c. Insert the rubber liner on the cow's nipples, try to get it from the back side of the cow



**Figure 14.** Rubber liner

- d. Cow's nipples start sucked in and release milk to flow into the hose and into the bottle



**Figure 15.** Milking Process

#### 4. CONCLUSION

Based on the findings of the research conducted it can be concluded that (1) the research phase starts from data collection, machine design, machine manufacturing, and performance testing; (2) the performance test results show that the machine is very helpful for cattle farmers in the milk milking process.

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