

Design of Batako Molding Machine Using Value Engineering Method

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Abstract— The method used in repairing this batako molding machine is the value engineering. In using this method, an initial design is needed, where there are problems experienced when making batako machine. The resulting mold is not good, so an assessment of the brick made was carried out. The results are not satisfactory making the product as reference for improvement. This method consists of six general stages, which can be used in this improvement, namely: the information stage, the creative stage, the evaluation stage, the planning stage, the reporting stage, and the implementation stage. After implementing the new way of working using a batako molding machine with a new design, a comparison is made to determine whether the repair effort is effective or not. For this reason, the calculation of the value of each tool is calculated. From the results of calculations, it is known that an increase in improvement from machine with the old design to a machine with a new design

Keywords— *Disain, Reliability, Validity, Value Engineering*

I. INTRODUCTION

The infrastructure in the city of Pekanbaru is experiencing very significant developments every year. Tall buildings have begun to appear in every corner of the city of Pekanbaru. One of the building materials used to support infrastructure is brick. Bricks are one of the building materials that are still often used by Indonesian people today. Brick molding currently still uses a lot of traditional tools, so the production process tends to be slow and the results are also not satisfying. Moreover, the demand for bricks in the community is very high. As a result, brick makers are very difficult to meet the demands of the community. As a result of the lack of brick production, the community tried to get another alternative as a substitute for bricks, namely batako. Materials needed to make batako are sand, gravel and also cement. These ingredients are still easy to get.

As the main support in making a batako, batako molding machine is needed. With the existence of a batako molding machine, it is possible to make it easier for people to make their own batako quality according to their desired qualities. The process of

molding batako using a batako molding machine is simply by mixing the sand, gravel, and cement together with water, and then stirring until blended. After that, it is put into a batako molding machine. Making a batako molding machine is quite easy and affordable. XYZ Batako Business is the name of a brick-and-mortar business located on Pasir Putih street, Siak Hulu sub-district, Kampar Regency. In the XYZ Batako Business, making a batako is still in a simple way without any supporting tools or machines. Batako is made using a wood molding, and then pressed by slamming or beating using wood. With the production process using this simple method, XYZ batako molding business can produce an average of 400 pcs per day.

A. Limitation of the Problems

To avoid overly extensive problems, the following problem limitation is made:

1. The study was conducted in the XYZ Batako Business.
2. Data were taken in May-June.

B. Problem Formulation

Based on the above background, the problems can be formulated, as follows:

1. What are the characteristics of the desired batako molding machine?
2. How to design a batako molding machine that suits the needs?
3. What is the cost of procuring a batako molding machine?

C. Research Objectives

The objectives in this study are:

1. Knowing the characteristics of batako molding machine.
2. Designing and making batako molding machine to maximize the production process in the Batako business.
3. Determine the cost of procurement of batako molding machine.

D. Research Benefits

The expected benefits of this research are:

1. This research as a science output obtained during the study.
2. Being a solution for the XYZ Batako Business to maximize its production process.
3. Adding insight and knowledge about the batako making business.
4. As a reference for future research.

II. RESEARCH METHOD

The following is a research methodology used to direct and simplify the analysis process in finding solutions to solve problems. It is hoped that by following the stages of this research methodology, the quality and content of this research will be better.

A. Preliminary Research

Preliminary research is the initial stage to find out what problems to be examined. The methods used to identify the problem are as follows:

1. Interview

Data collection techniques were carried out through face-to-face and question and answer directly with several Pekanbaru residents to find out what complaints were felt related to the batako, then asked directly about the plan to make the batako molding machine.

2. Observation

Data collection methods are complex because they involve a variety of factors in their implementation, one of which is the XYZ Batako Business that was interviewed with the existence of a plan for batako molding machine.

3. Questionnaire

Data collection was done by giving a set of questions or written statements to several residents to be answered. The questionnaire used was an open and closed questionnaire. An open questionnaire was used to find out the wants and needs of consumers for the batako molding machine products to be made later, while the closed questionnaire was used to find out the level of importance and satisfaction with the batako molding machine design products which would be made later as an alternative to the manual batako molding machine which is still very simple that is used by the XYZ Batako Business.

B. Literature Review

The theory presented in the literature review chapter explains the relationship between several concepts used to explain research problems. These concepts will then be translated into research variables. Therefore, this chapter presents research findings related to research problems or variables that have been carried out by previous researchers, including a literature review of a batako molding machine, a literature review of the Value Engineering (VE) method. Based on these findings, the researchers then present a theoretical framework explaining the relationship between the variables to be studied. Value engineering methods are developed to provide a way of value processing and

efforts to increase systematic innovation to provide competitiveness for a product. In short, through this literature review chapter, a researcher is expected to be able to provide readers with an explanation of the rationale or theoretical basis of conducting research, especially regarding why a problem is chosen to be studied and why certain variables are considered to provide clarity to the problem to be studied.

C. Problem Identification

Problem identification is a stage of mastery of existing problems, in the XYZ Batako Business where a certain object in a particular situation can be identified as a problem. Therefore, a batako molding machine is designed that can facilitate the XYZ Batako Business. The purpose of identifying this problem is make the readers get some understanding regarding the problems related to the title of the research.

D. Formulation of the Problem

The formulation of the problem are the questions that will be sought answers through data collection and data processing of the business founded by XYZ Batako Business. The purpose of the problem formulation is to make the problems studies clear.

E. Research Objectives

In a study, there will be results that will be achieved. The success of the research can be seen from the research objectives whether it has been achieved or not. Therefore, setting research objectives is a target to be achieved in an effort to answer all problems that are being faced/researched.

F. Implementation of Method

At the implementation stage of this method, there would be several processes that would be passed, including identifying the needs of consumers for batako products obtained from an open questionnaire. After the identification process, the next thing is the closed questionnaire design process to find out the level of importance and level of satisfaction with the product that we would be made later. After the closed questionnaire is complete, we continue at the stage of distributing the closed questionnaire.

After the data from the closed questionnaire that we distributed was collected, the data is processed, and the validity and reliability testing process would be carried out. If the data were valid and reliable, the data would proceed to the Value Engineering method process and the batako molding machine design process and then continue at the stage of determining the cost of procurement of batako molding machine.

1. Information Stage

Gathering as much information as possible includes information about the system, structure, functions and costs of the object being studied. This stage also addresses the problem of who is doing, what can be done, and what should not be done.

2. Creative Stage

It is the stage to develop possible alternatives to fulfill primary and secondary functions. This stage also answers questions about the ways to find needs, what is displayed by the desired function.

3. Analysis Stage

This stage evaluates alternatives that have been formed and make the largest choice of values. This stage also answers questions about what to do, and how much it costs.

4. Development Stage

This stage is to make improvements and adjustments to selected alternatives. This stage also answers the question of what else to be done at work

5. Presentation Stage

This stage explains the work of the value engineering team to management. This stage also answers the question of which alternative is best, what is the effect of developing ideas on alternatives, how they are costed, and how they are performed.

After the implementation process of the Value Engineering method is passed, the next step is to design the product based on the variables obtained in the previous stage, the design of the batako molding machine would be made using the 2017 Solidwork Software. After the product design, it continued at the product manufacturing stage.

III. RESULTS AND DISCUSSIONS

A. Results

From the data processing that has been carried out, the design of the batako molding machine is as follows.

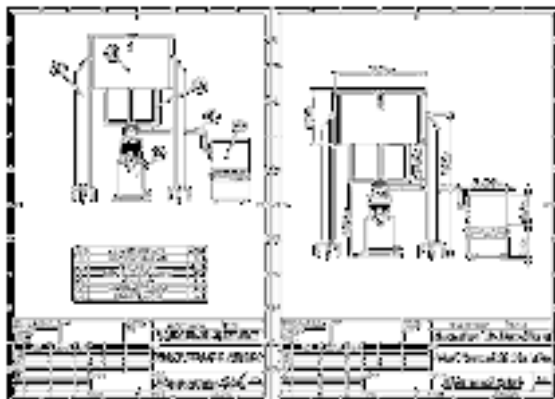


Figure2. 2D Design for Component of Batako Molding Machine

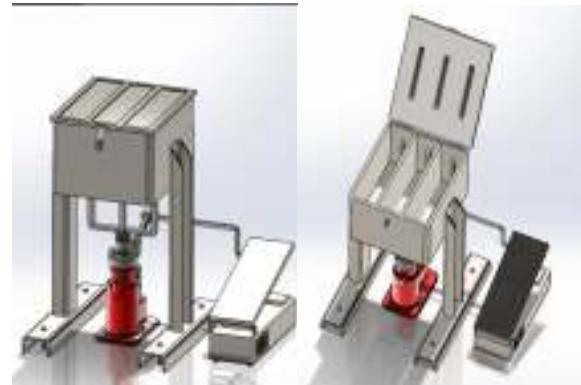


Figure 2. 3D Design for Component of Batako Molding Machine

B. Discuss

1. Questionnaire Distribution

To know the characteristics of batako molding machine that fits the needs of workers, this questionnaire was distributed as many as 30 to batako molding workers. The following is the data of the distribution of questionnaires results: practical and fast, safety, durability, price, design, capacity, and efficiency.

2. Validity test

From the results of closed questionnaire processing, the data obtained must be tested whether valid or not using the SPSS 22 software. It can be seen that the data of importance and satisfaction level tested using the SPSS 22 software are declared valid, because the correlation probability value is smaller when compared with the value of $\alpha = 0.05$

3. Reliability Test

Based on the results of processing, the reliability coefficient (Cronbach Alpha) is 0.719 and 0.915. Declared reliable if the Cronbach Alphabet value $>$ of the r table value at $N=30$, $DF=N-2 = 30 - 2 = 28$ with $\alpha = 5\%$ then the value of r table = 0.361. N is the number of questionnaires distributed. Based on the criteria, the Cronbach Alpha value above is already greater than 0.361, the results of the questionnaire data have a good level of reliability, or in other words the results obtained can be trusted.

4. Creativity Stage

In this study the design is based on alternative choices from workers by distributing questionnaires, so the results of the design of the machine are in accordance with the wishes of the workers. The selected alternatives are based on variables from the user of the machine that is selected in alternative 1.

5. Analysis Phase

The alternative ideas are evaluated based on the most choices of the use of the machine of the choice of dominant workers to the first alternative with a total of 113 workers' answers. Therefore, the chosen alternative is the first alternative in this design, and the material used is iron plate, angle iron and iron ump. The expenditure calculated from the total price of raw

materials used is Rp. 671,000, with the price of machines Rp. 342,577.

6. Development Stage

The explanation of the results of the alternative ideas chosen according to the wishes of the community based on the distribution of questionnaires is outlined in a batako molding machine design in the form of 3-dimensional images and ready-made tools

7. Recommendation Phase

At this stage, recommendations are given for the alternative batako molding machine that is selected and suits the needs of workers, and then there will be better ideas that can be developed in further research.

III. CONCLUSION AND SUGGESTIONS

A. Conclusion

The conclusions that can be drawn from this study are as follows:

1. The specification of the machine needed by the public is known based on the results of the distribution of questionnaires that can be seen from a number of aspects including: the use of practical and fast tools, safety, strong tool durability, price and attractive shape design, mold capacity, efficiency.
2. The proposal for the design of batako molding machines in accordance with the needs of the community is as follows:
 - a) The use of machine that is easy and fast
A working system that uses elastic spring force that is pressed at the top of the pedal
 - b) Safety
The addition of tools that maintain the safety of workers while doing work, tools used in the jack and handle legs
 - c) Strong endurance
The material used, steel plate, iron ump, each angle iron has a different shape but has a strong resistance and also affordable prices
 - d) Economical price
making high quality molds at affordable prices so that the batako molding machine entrepreneurs can increase the production of the batako making
 - e) Attractive design
the design used must be attractive and have a size that is consistent with the standards on the market
 - f) Capacity
more capacities are made than previously made, to make it easier for brick making companies in the printing process.

g) Efficiency

the basic idea is taken from initial printing where the initial printing is still manual and tends to be slow so I designed a tool that can increase production and maximize printing.

3. The price of equipment per unit of Rp. 342,577. -

B. Suggestions

1. The design of machine in this study can still be further developed by the addition of multifunctional other tools, like using a motor for presses
2. For the next researcher, it is hoped that this research can continue by adding methods, characteristics and feasibility aspects in this design.

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