

## Mobile Simulation Circular Angle Cutting Product for Tooling on Welding Application

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**Abstract:** The quality of finishing that is not uniform in machine use is a source of problems and often occurs when making cutting-edge designs. Therefore, a study was developed to invent a Mobile Circular Angle Cutting Machine that can be used for the circle cutting process for a circle- shaped design. The development of this mobile circle cutting machine utilizes the ADDIE model consisting of 5 stages used in the development of this product which were, the process of interviewing, gathering information, analyzing data, product design, implementation and evaluation. This mobile circle cutting machine could not be developed in the exact form as described in the study limitations. However, it was developed by using inventory software to simulate the machine. This cutting process uses a machine grinder which is a key tool in iron cutting. This cutting process can provide finesse and uniformity of the cutting result and can also save time. This round angle cutting machine is only capable of cutting cuts of 0.5 mm, 0.8 mm and 1.2 mm thick metal pieces to avoid damage to the grinder machine points used on the round corner cutting machines. The researcher also obtained endorsement from three experts in engineering, industrial design and welding. The results from the simulations developed show that all experts have agreed that this product will work well and can be developed for the purpose of rounding the corners. However, this portable cutting machine still has room for improvement in the metal manufacturing industry.

**Keywords:** Mobile Simulation, Angle Cutting, Design and Development

### 1. Introduction

The problem of unskilled operation operators and methods of use is one factor and often occurs when making round design cuts. In the process of cutting a circle, most of these workshop users only use manual methods such as first drawing a circle shape by using an iron marker on the metal they want to cut precisely and equally for each round cutting. This method will make the cut that will not be uniform with the first cut and give it a rough finish. Unity is the result of something good and good (Abdul Rahim, 2014). Other semi-automatic machining operations have not yet been implemented in welding workshops. So, workshop workers are still using manual methods or manual methods. This causes manual cuts to take a long time using the cutting tools to be developed. Excessive cutting work will be

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done by workers doing the repairs according to their actual size and size. The production of time-consuming products can result in incomplete design, as well as poor workmanship (Aggyekum et al. 2014). The use factor of machine size is too large and heavy for every worker to use it. Size relates to manufacturing costs. It is an important factor in the operation, portability and installation of a device or machine. If the machine is too large to meet the need for transport, mobile and installation processes, then it is important to think about dividing the design into smaller portable components (Kasim Jalil, 2007).

## 2. Methodology

Research on the development of this product using the ADDIE model. The ADDIE Model was founded by Rosset in 1987. According to Hall (1997), the ADDIE model is a basic-based design that can be integrated in any learning strategy. The ADDIE teaching Model consists of analysis, design, development, implementation and evaluation phases.

### Phase 1 : Analysis

The analysis phase is a phase or process of identifying problems studied for project development purposes. Observations and analysis are made based on the search of the Internet and stores selling workshop equipment. The observations performed are based on grinder machines, magnets and hole iron. Although the equipment is not about the design of the roundabout angle, the product that will be developed by the researchers uses a machine grinder as its main system. The use of this grinder machine tool applies in the product and it is very important to researchers to take note of this deduction. Studies and trials that have been done not one hundred percent covering the cut-off circle form but the study is done on the components required in the development of this circle-angle cutting design product. The concept of using this cutting machine is also very important to facilitate the smooth running of the project without interference in terms of product development theory.

### Phase 2 : Design

In this part of the researchers have made a sketch of some design ideas to be considered and made a selection of developed designs. Researchers have used a matrix evaluation method to choose the design. The appropriate design selection is important as it determines whether researchers have successfully achieved research objectives or otherwise.

Figure 1 shows the sketch that has been chosen as a product that will be used in the development of a portable circle-roll corner machine developed by Autodesk to create a 3D digital prototype. It is used for 3D mechanical design, design communication, tool creation and simulation of products. Researchers making this Inventor software to produce more detailed sketches. A chosen design must have certain features to attract the interest of the users. Therefore, the selection of design is the main factor the needs of consumers. The result of the final design is the improvement of the first sketch, second sketch and third sketch.

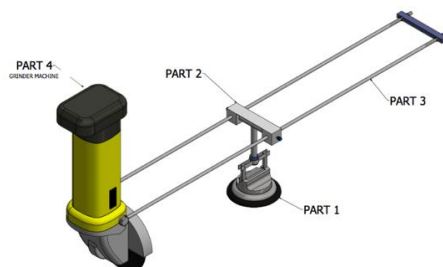


Figure 1: Product sketch

### Phase 3 : Development

Materials and components are very important in the development of a design. There are many new ingredients available and developed by the latest technology process. Therefore, the use or selection of new materials is driven by the need to meet new determination such as weight reduction, energy savings, strong resilience and so forth. The selection of materials should be emphasized to ensure the quality of the design produced and the cost of manufacturing. The component selected also needs to coincide with the design operation so that the developed design can be adopted by the user.

The selection of product design materials is based on material selection criteria appropriate to the type and use of products based on the selection criteria of material in design engineering. The construction process of this product design is divided into three levels, namely:

- Simple way of handling
- Has safety features
- Has strong material durability
- Portable and handy everywhere
- Improve the way machines operation using manual method

### Phase 4 : Implementation

In the implementation phase, once the product is developed and verification process by experts is carried out. In order to produce a design, sketch and translation in drawings is essential to facilitate effective simulation development. Therefore, in order to develop this curry puff filling machine simulation, it requires software. Thus, as the main software to help researchers in producing this product simulation, the necessary software and researchers have chosen to use Autodesk Inventor software.

Based on the design defined in terms of design phase, the process of developing a simulation of the mobile roundabout will be carried out in this development phase. Therefore, researchers use Autodesk Inventor software to develop two-dimensional paintings (2D), three-dimensional (3D) and even portable roundabout corner cutting machine simulation. This development was initiated by creating a painting of the main parts of the machine.

The implementation phase is implemented after the development of the mobile circle is fully developed. This phase is important as it involves a testing process on simulated functional reliability that will be carried out on the ready simulation. If this portable circle's cutting machine simulation is not functioning properly, this process will be repeated in the development phase for the purpose of improvement on the simulation. The objectives of the study will be achieved if the process for each phase is successfully implemented.

This phase is able to demonstrate the functional reliability of this mobile circle's angle cutting machine and will be evaluated by experts. The experts will provide comments and suggestions on the products that have been tested based on the expert assessment form developed by the researchers. Last but not least, the results collected by researchers will be analysed about whether the objectives of the study are achieved or not. Figure 2 is a section drawing that you want to simulate.

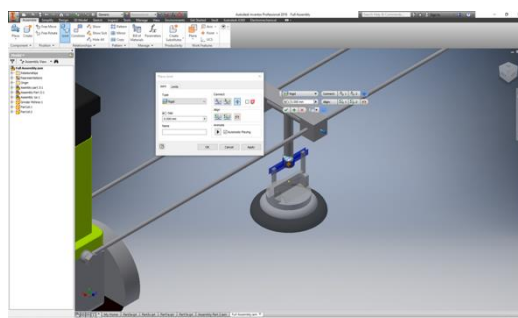


Figure 2: Section drawing

### Phase 5 : Evaluation

The project evaluation phase is a phase that determines the safety and lifetime of the product. The maintenance process is made by examining the components, circuits and models as well as the circuit extension so that it is in perfect conditions before and after use. Periodic checks are also performed so that the devices used do not exceed life span. In addition, the maintenance of design is also made to ensure that the model condition is always neat.

The final phase of the ADDIE model is the analysis phase. In this phase, researchers did test on the design after completion. Researchers do three types of instruments namely:

- specialist confirmation
- observation

### 3. Results and Discussion

The evaluation phase is the final phase in the process of simulating the mobile circle. In this phase of assessment, the selected experts will make an assessment in terms of product design and the functional reliability of the portable roundabout angle cutting machine. The process of assessment is to identify whether the machine developed is in compliance with the objective or not in compliance with the objectives. Researchers choose three assessors that specialize in their fields to help assess the product and functional reliability of the products.

#### • Design Expert Analysis

The main objective of the development of this portable roundabout is designing products in order to enhance security features in the use of machines in design production which has a circle design. Therefore, researchers analyze the suitability of products and functionality by getting certification from experts. All specialists are given a checklist to evaluate the travelling of mobile circle cutting machine simulation. Table 1 shows a percentage of analysis of the design of simulation of the portable Roundabout Corner cutting machine in the sign by experts- experts.

**Table 1: Analysis of the design aspect of the portable roundabout angle in the production of circle type design**

No	Question	Expert 1	Expert 2	Expert 3
1	Does the machine design provide efficiency to consumers when operating this machine?	Yes	Yes	Yes
2	Does the design of this circular cutting machine have ergonomic features and comfort when used?	Yes	Yes	Yes
3	Does the design of the machine come with safety features when used?	Yes	Yes	No
4	Does the design of the machine have the same durability as the material used in the production of this machine?	Yes	Yes	Yes
5	Is the machine design easy to maintain/install?	Yes	Yes	Yes
6	Is this machine design mobile?	Yes	Yes	Yes
7	Does this machine design have the right size?	Yes	Yes	Yes
8	Is the design of the machine perform cutting and uniform cutting?	Yes	Yes	Yes

In the results of analysis on design aspects based on the simulation of this mobile circle-line cutting machine, it shows that all three specialists are nearly selecting Yes in all the questions given except the

3 experts who choose not in question 3 to provide suggestions to further enhance the security features during the cutting process and so the products can be developed in a real situation. Hence, almost all experts agree that the design is suitable to achieve the objectives. Nevertheless, all experts propose or make improvements on the characteristics of the safety of the portable Circle's cutting machine design which will be developed later. Referring to the first expert, second expert and third expert found that the development of the mobile Circle's cutting machine product is suitable and relevant to be developed. For the first item in the design aspect, the first, second and third experts agreed that the machine developed was able to provide efficiency and easy to operate. For the second item, the three experts also think and agree that the machine will be developed with ergonomic and comfort features (each work or assignment can be done comfortably, safe, and effective) when used. This is because the machine can be used in various positions according to the user's comfort. Based on third items, the manufactured machine is equipped with security features, all experts agree with the specified item. But all experts provide comments and suggestions to strengthen the level of security in terms of fire sparks occurring during the cut that are recommended by experts 2. For expert recommendation 1, suggest that the material used before developing this product in the test is first to get the bending resistance before it is used.

For the fourth item stated at the design aspect, does the machine design have the durability in accordance with the material used in the production of this machine, there is no recommendation given by the three experts. For the five items, the design of this machine is easy to open/install easily, on the analysis of the simulated video that displays all the experts' opinions. For the eighth item, all the experts agree that this mobile circle cutting machine can make cutting circle types.

• **Functional Reliability Expert Analysis**

of the functional reliability of the Lim-only question that is to study the functional permeation of the overall portable roundabout angle cutting machine simulation has been developed. Table 2 shows the aspects of design simulation of the portable Roundabout Corner cutting machine, obtained by a third – three experts.

**Table 2: Aspects of design simulation of the portable Roundabout Corner cutting machine**

No	Question	Expert 1	Expert 2	Expert 3
1	Is this machine working properly and systematically?	Yes	Yes	Yes
2	Is this machine portable and easy to install?	Yes	Yes	Yes
3	Will this machine be able to do full circle cutting in a short time?	Yes	Yes	No
4	Can this machine produce uniform and neat cutting?	Yes	Yes	Yes
5	Is it possible to do a more efficient corner cutting job?	Yes	Yes	Yes

Based on specialist studies conducted using questionnaires, three specialists were selected to verify the aspect of the product's functionality that was developed. Based on the first item, the three experts agreed that this machine could function systematically and well. Based on the second item, the three experts agree that this mobile circle cutting machine is easy to install in a short time. However, based on third items the first expert and third expert agreed that this machine could do full circle cutting at a short time, but the second experts stated not on this item and commented that the speed making shape of the circle based on the metal thick to be trimmed. As for the fourth item, all experts agree that this machine can produce a uniform and neat deduction while making a deduction. For the last item, all the experts agreed that the machine would be able to keep up with the work of a circle-to-use roundabout that could be used more efficiently, but there are recommendations from first-hand specialists to have necessary steps in safe use before using this machine. The result of this analysis shows that all three experts choose Yes in the five questions. The functional reliability level of this portable circle cutting

machine is functioning properly. All the experts agreed that the simulated machine simulation of the portable circle works well and can be developed later. However, the expert also suggests or makes improvement in terms of the system used and Consistency when doing a roundabout shape cuts. Here are the views and expert reviews.

- Expert 1

The first expert to evaluate this state that the generation of ideas through simulation should be refined again with the need for production. In addition, the expert also states that the simulation of the mobile circle is an innovation idea that can provide uniformity and neatness of cutting results.

- Expert 2

The second expert that assesses the product can be developed for student use for the purpose of designing a more attractive form. Nevertheless, improvement should be done by adding a more secure security features system.

- Expert 3

The third expert that evaluates has stated that the simulated development can help the development of the actual machine in the future and can be used. Besides that, the simulation shown can be understood properly.

#### 4. Conclusion

As for the conclusion, an expert assessment was made to identify the design of this mobile circle cutting machine. Experts suggest some improvements that need to be done so that the development of this mobile circle cutting machine is better and further enhances the security features so that this machine will not give harm to the user during the cutting process.

Based on the assessment, researchers provide suggestions for improvement and provide opportunities to other parties to improve the development of the mobile Circle's cutting machine in order to become better. The proposed improvement should be done in terms of design and security features.

There are several comments and suggestions from researchers for the improvement of the portable roundabout corner. This proposal is to enhance the existing quality of the simulation of this mobile circle. This proposal is also to further enhance the cutting process to be done. Based on this study, researchers only perform functional testing based on the simulation that has been developed. Therefore, researchers expect to study in future studies to do functional testing with actual product production so that the findings of the study will be better.

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