

## Magnetic Holder for Grinding Machine for Angle Cutting

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**Abstract:** Product cutting is one of the most important processes involved in the production of a product regardless of industry, private workshops or learning institutions. A good cutting process will result in a neat product that will work well. This is because every material that needs to be cut and prepared to produce a product needs to be in the right size and less error especially when making angular cuts. Failure to perform this deduction process will result in the disruption of the product. The purpose of this study was to design, develop and test the functionality of magnetic holder for grinder machine to angular cutting is developed to facilitate the process of making angular cutting of project material desired. This product is developed using the ADDIE model which consists of five phases namely analysis phase, product design phase, product development phase, product implementation phase and product evaluation phase. Magnetic holder for grinder machine for angular cutting is tested in terms of the permissibility of the holder to hold the project material to be cut, to test the permissibility of the workpiece holder and to test the functionality while carrying out the work of cutting the workpiece according to the size required. To test the feasibility of this product, three product experts have been selected to test the product to ensure it works properly and safely when using it. Run test were performed three times to obtain the average cutting size of the workpiece according to the required size.

**Keywords:** Adjustment Magnetic Holder, Grinding Machine, Angle Cutting

### 1. Introduction

In the field of precision machining to produce and determine the quality of a product is crucial (Rosli et al., 2015). The quality of a product in ensuring the demand and demand of the product is met. Therefore, every aspect must be considered in order to produce the product (Mohamed et al., 2016). Each process involved requires improvement in various aspects to determine the fineness of the product (Patwari et al., 2015). The main process is the cutting process that needs to be done in the beginning to produce a product. The definition of deduction in the Dictionary of the Language and Library Council states that the deduction involves the act or omission. The cutting process can be done with many types

of cutting machines where the mobile grinding machine is one of the main cutting tools in machining workshops. Preliminary studies were conducted at the General Machining Laboratory to study the need for angular cutting products for student use. The results of this preliminary study found that problems often occur during the process of cutting raw materials to produce a product using a portable machine that is an error-prone cutting point. This is particularly true during the cornering process. On the workpiece during the cutting process students often use manual process of using the ruler and markers to make the cut of the raw material, thus making it a mistake to make the angled listing and causing various problems to occur especially in terms of waste. This aspect of waste is seen as a major factor when this problem arises when the cutting process is in error, the workpiece is unbalanced and so on. This causes the incorporation of two or more ingredients to be incomplete (Patwari et al., 2015). Therefore, in this case students will need to make a longer deduction process that will take longer. Students had to create a new cutting process starting from the beginning. This will also result in a shortage of raw materials purchased according to the needs of the product. In addition, students are exposed to danger during shaking during the material cutting process due to poor workmanship (Chavan, & Bari, 2015). This condition also affects the surface of the uneven workpiece and results in rough steel fragments at the cutting edge and can eventually cause the student's hand to be injured while holding it. In conclusion, in the project being developed, the researcher has solved the problems encountered in the angular cutting system of the workpiece needed in developing a product. The development of magnetic handles for grinding machines for angular cutting will know what to do to avoid the above problems, high accuracy problems will be avoided and will ensure safety while using the actual product already developed (Patwari et al., 2015).

### 1.1 Problem Statement

The problem that can be concluded that General Machining students at the Faculty of Technical and Vocational Education (FPTV) face difficulty in making angular cuts using canoes for the process of merging from one material to another. This causes the student to manually perform the angular cutting process and repeatedly tries to put together two or more required materials. Magnetic holders will be able to hold metal or workpiece more firmly to prevent movement when cutting the workpiece using a grinding machine. The process of cutting an angular workpiece using a grinding machine was not using the angle scale and only cutting to produce an angle. Also problematic is the process of wastage if the angular cutting process is wrong and will result in the use of new raw materials to produce a product. As a result, the cost of producing one of these products will increase and will result in a shortage of materials for use in other products. Furthermore, it will take a long time to produce the product if the angular cutting process is in error. The length of time it takes to produce a product will cause other processes to be delayed.

### 1.2 Objectives

The objective of this study was to:

- i. Design magnetic holder for grinding machine for angle cutting.
- ii. Develop magnetic holder for grinding machine for angle cutting.
- iii. Test the functionality magnetic holder for grinding machine for angle cutting.

## 2. Methodology

ADDIE model is used in this study as a guideline for developing power transmission system for wood crusher machine. ADDIE model has been chosen because the elements in this model are suitable for use in the product development process because this model are more organized and systematic. This

model has five elements that can make development process easier which is ADDIE are stands for analysis, design product, development product, implementation product and evaluation the product.

### 2.1 Phase of Analysis

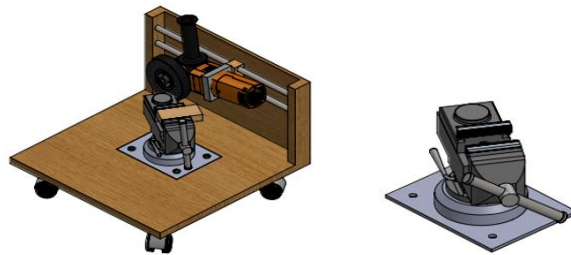
In this phase, the preliminary studies were conducted using the document analysis method. Document analysis was carried out based on previous studies using articles and journals. In this phase, problem need to be identified. There are a few things that need to be analysed as a guide to developing product such as determine the scope of the study, determine the statement problem, design the suitability, and make the data analysis.

### 2.2 Phase of Design Product

In this phase, a product has been designed to simplify the cleaning and disposal process. The design has been developed using Solidworks software. The presence of this product design will make it easier for the researcher to determine the position of the material in this product. Once the design is completed, it needs to be certified by an expert to see the product suitability. After the product design has been approved, the next step can be proceeding and if the design is rejected, researcher need to redesign the design.

### 2.3 Phase of Development Product

This phase is done as soon as the design process is complete. This phase involves wiring, measuring, cutting, and assembling materials to form a product. Working to develop a product will change over time according to the design of the product to achieve the set goals. The process we did in this phase was to create a framework, install the power transmission system, make connections for each component, and perform product specifications. After this product is complete, it needs testing to make sure it works. If this product works properly, the next step can be continued. Figure 1 shows the design of magnetic holder for grinding machine for angle cutting developed for this study.



**Figure 1: Design of magnetic holder for grinding machine for angle cutting**

### 1.4 Phase of Implementation Product

This phase begins when the product is in the development phase are completed. In this phase, the power transmission system will be tested to ensure the functionality, capabilities, and durability of the product. This product will be tested and requires verification by a specialist in machining to determine if it is working properly. In this phase of implementation, it is important because it involves testing the objectives that the researcher has stated that the product's functionality will be carried out on the finished product. The level of product functionality can be further demonstrated in this phase for expert evaluation. The final step can be continued if the product is certified by a specialist.

### 1.5 Phase of Evaluation

The expert evaluation stage is the final stage of the process. Once the product is tested, the evaluation process will be carried out by the specialist to make sure the product is working or not and meets the stated objectives. The method used for expert evaluation in this phase is done using expert verification form and questionnaire.

## 3. Results and Discussion

Processes involved in the implementation phase include product run tests to see product functionality. While the evaluation phase is the process of determining whether the objective has been achieved or not. A running test will be conducted to ensure that the product works, and the questionnaire was used as a research instrument and were provided to experts to evaluate the effectiveness of the product. This test consisted of an analysis of the magnetic handle adjustment according to the size of the material required and the analysis of the magnetic handle angle adjustment while making angular cutting process using 670W power of grinding machine.

**Table 1: Adjustment by Size and Angle of Workpiece by Type Of Workpiece**

Type of material	Material Size (mm) / Angle (°)					
	Angle	Size	Angle	Size	Angle	Size
Wood	40.2 °	30 mm	31.0 °	30 mm	45.5 °	30 mm
Hollow steel	41.5 °	10 mm	30.5 °	10 mm	10.3 °	10 mm

Table 1 shows the results obtained from the magnetic handle adjustment of the grinding machine for angular cutting tested using a given type of workpiece. This finding shows the results obtained when making angular cutting proceeds derived from adjusting the angles of the worker's body.

**Table 2: Manual Cutting Tools Using Product Prototypes and Magnetic Handles for Grinding Machines  
Material Type Manual Prototype Product**

Type of material	Manual		Product prototype	
	Angle (°)	Size (mm)	Angle (°)	Size (mm)
Wood	43.0°	40 mm	40.2°	30 mm
Hollow steel	35.0°	40 mm	31.5°	30 mm

Table 2 shows a comparison of two methods of cutting the workpiece which uses a grinding machine which is a manual cutting and uses a magnetic handle for a grinding machine for angular cutting. To use the manual method of the workpiece clamped to the workpiece where the handle will cause improper angular movement and limited cutting of the workpiece during the cutting process while using the prototype handle method, the workpiece can be held firmly and will not cause any angle inaccuracy. This process of cutting is important because it is the beginning of the production and production of a product, where the cutting process will cause the mixing of one workpiece with the other to work poorly and this process needs to be repeated to get the required work size exactly.

### 3.1 Evaluation by experts

Expert evaluation is done by using expert verification form and questionnaire. This is intended to ensure that the product produced is safe and can be used. There are four items built in section A which is design the product. All three experts had agreed with the design shown was suitable for use in magnetic holder for grinding machine for angle cutting. In addition, the experts agreed that this product was easy to maintain. In addition, all the experts agreed the components and material used to develop this product were easy to find and reasonably priced. Finally, they also agreed that this product worked well and effective.

Besides that, all experts had given their suggestions to improve this product for better performance. Based on their suggestions, the researcher concluded that the development of this magnetic holder for grinding machine for angle cutting had worked satisfactory well. However, experts recommended making improvements in terms of product durability and design to be more stable.

#### 4. Conclusion

The conclusion of the comprehensive development of magnetic holder for grinding machines for angled cutting process can be concluded with the successful development of prototype products according to set objectives. This product can also be used by students who need to produce a product that is needed in a subject. In addition, the magnetic handle of the grinding machine for the angular cutting process reduces the time of manufacture of the product because the cutting process does not need to be repeated several times. Finally, all the aspects discussed in this chapter can be used as guidelines and guidance for future researchers for the improvement of this product.

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