UNIVERSITI TEKNIKAL MALAYSIA MELAKA
(UTeM)

ELECTROMAGNETIC CHIP COLLECTOR (EMCC)

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Manufacturing Engineering (Robotics and Automation)

By

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Faculty *of* Manufacturing Engineering

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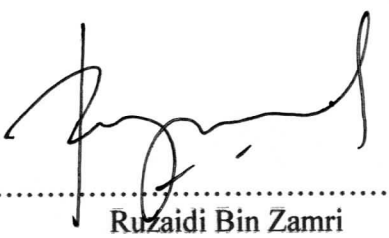

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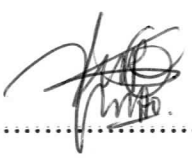
I hereby, declare this thesis entitled "**ELECTROMAGNETIC CHIP COLLECTOR (EMCC)**" is the result of my own research except as cited in the references.



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ABSTRACT

Electromagnetic Chip Collector (EMCC) is a modification prototype from the current used of Manual Magnetic Chip Collector (MMCC). The purpose of this prototype is to develop a functional prototype that have a electromagnetic function and motor drive for lifting mechanism which is very useful to the operator at the metal machining industry or machining workshop in educational institutes. To implement the development of this prototype, it involves some of methodology flow. Started with project planning, information searching and then further with prototype development, there was been manage well until the testing that determine the functional of EMCC prototype. By done a lot of revision and study about the previous researches, its help more to understand the electromagnet concept and its application for use in this prototype. In addition to have a good result of this project, the information about electromagnetic is also gathered from the published books, articles and journals as good guidelines. Besides getting sharp of design skill, the extra gaining of knowledge in evaluates and select the best design concept are really valuable. Through the research information, the idea of design concept is contributed from the current product that available in the industry and purchasing marketplace. Some new idea also had been generated by the good example of the current used products. Then to make all the things of information useful, it already performed in real outcome of EMCC prototype at the end of the project implementation period. EMCC apply the electromagnetic mechanism that is controlled by a indicator switch. The other extra features are the motor drive of lifting mechanism and the more attractive design of the main structure. All the path of prototype development phases is explained clearly in the methodology stages and the results discussion is completed in the next chapter. As prove of the project completion, this is the full report which is story all about the project development and the final outcome, the functional EMCC prototype.

ABSTRAK

Electromagnetic Chip Collector (EMCC) adalah sebuah prototaip yang diubahsuai daripada Manual Magnetic Chip Collector (MMCC). Tujuan prototaip ini dibangunkan adalah untuk menghasilkan sebuah prototaip yang mempunyai fungsi elektromagnet dan mekanisma angkatan dengan pacuaan motor di mana ia begitu penting untuk kegunaan operator di dalam industri pemesinan logam dan pelajar di institusi-institusi pendidikan. Perlaksanaan projek ini melibatkan beberapa kaedah. Bermula dengan merancang, mencari maklumat dan diteruskan dengan pembangunan prototaip, segalanya diuruskan dengan baik sehingga peringkat pengujian untuk menentukan keberkesanan fungsi prototaip. Rujukan mengenai kajian-kajian terdahulu banyak membantu dalam memahami sifat-sifat dan konsep elecktromagnet serta aplikasinya. Untuk mendapat hasil yang baik, pelbagai informasi berguna mengenai elektromagnet dikumpulkan daripada sumber-sumber seperti buku-buku rujukan, artikel-artikel dan juga jurnal-jurnal para ahli sains dan teknologi sebagai rujukan. Selain itu, kemahiran merekabentuk prototaip dibantu oleh pengetahuan tambahan dalam menilai dan memilih konsep rekabentuk yang terbaik juga diadaptasikan. Melalui penyelidikan terhadap informasi yang terkumpul, idea dan konsep rekabentuk diperolehi daripada produk yang sedia ada digunakan di industri dan juga terdapat di pasaran. Kemudian, untuk memanfaatkat idea dan maklumat yang ada, ia hanya dapat dilihat dengan kelancaran proses pembangunan dan hasil prototaip EMCC yang sebenar pada akhir perlaksanaan projek. EMCC mempunyai ciri-ciri elektromagnetik yang dikawal menggunakan suis penunjuk dan mekanisma angkatan menggunakan pacuan motor. Struktur utama prototaip juga direka supaya lebih selamat dan selesa digunakan. Setiap langkah perlaksanaan projek ini telah dijelaskan di dalam ruangan metodologi dan keputusan serta perbincangan hasil projek juga dibentangkan secara terperinci di dalam tesis ini sebagai bukti selesainya projek ini.

DEDICATION

For my parents, my father Mohammad Bin Hj. Omar and my mother Nor Hayati Binti Jusoh, my brothers and sisters, also my friends.

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The Name of Allah, The Most Gracious and Merciful.

Alhamdulillah, praise to The Almighty Allah SWT who gave me the strength to complete this project. Firstly, I would like to express my gratefulness towards Allah S.W.T because giving me the opportunity to finish my final year project. Without faith towards the almighty, I would not have the confidence to finish this project. I would like to thank my beloved family for showing love, support and advice when in truly need. I would like also to express my greatest appreciations to my wise supervisor, Mr. Ruzaidi Bin Zamri, truly without his guidance, I would have been lost. Not to forget to thank the technicians who gave me a lot of assistance and information. And the last but not least, this acknowledgement is also to the lecturers and my friends for their attention and support. Thank you very much.

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K Electromagnetic Platform Bracket

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LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

BOM	-	Bill of Materials
BUE	-	Built-up Edge
EMCC	-	Electromagnetic Chip Collector
MMCC	-	Manual Magnetic Chip Collector
NiCd	-	Nickel Cadmium
SOP	-	Standard Operation Procedure

CHAPTER 1
INTRODUCTION

1.0 Introduction

Cutting processes is also known as metal removal process that produces metal chip. The most common machining processes which produce chips are turning, milling and drilling operation. Metal chips or scraps of steel actually remove pieces of metal that is not used or involved in final product. The aspects of tiny and sharpie, the metal chips produced makes working environment unsafe.

Safe Working Environment cannot be "built-in" to a workplace –
that factor can only be supplied by a responsible operator!

The judgment in the sentence above is trying to advice all the people in the related field of engineering to be concern about safety. Even with good condition of machinery in the production line during machining process, it is hard to expose the operators to extremely dangerous if the environment is not secured. Metal machining generates large amounts of extremely hot metal chips as they come off the tool bit and the workpiece.

The chip remains a safety concern even after cooling due to their sharpness and accumulation in the immediate work area. Chips can cause severe cuts for the operators fingers while being cleared from operating machines and long chips can "drag" over and around the machine, posing a serious safety concern. The operators been reminded never to remove accumulated or moving chips from a machine as well as scattered chips on the floor with their fingers.

Chips on the floor of the work area can cut into, short or sever electric cords even the operator's body also. Sharp chips can completely cut hoses or lines if stepped on, or if machinery is rolled over them. By only having brooms and waste containers handy and manage cutting debris in the work area is still not enough. The easiest way for the operator is to use a device that easily functions to collect the harmed chips on the floor. It is a good reason for developing useful cleaning equipment like EMCC compare to the brooms or vacuum cleaner or the manual functions of MMCC currently. Therefore, the future development of EMCC could increase or improve the judgment or ability of the operator to work in a safe manner.

1.1 Background of Problem

In industry, which involves machining actually, it is common to find metal chip around the machining area. The operator has to clean up the chips by sweeping the floor using a broom or a vacuum cleaner. It needs effort of operator and it is time consuming. The broom has short product life cycle because it is not meant for sweeping metal chips.

Also for vacuum cleaner, it is not practical in term of cost. It performs with electric supply and sometime needs high maintenance service. For more practical and low cost application that currently used in metal machining industry it is better to use manual magnetic chip collector. Nevertheless, it is not efficient enough and not too friendly with the user, or operator. The manual magnetic chip collector as shown in the figures below need the operator to roll or shove the machine on the floor where the metal chips scattered by their own effort. The magnetic function works when the operator sets a permanent magnet block down near to the floor. The chips will stick on the magnet block as the magnet takes affect. Then, to place the metal chips into the scraps container, the operator have to lift up the manual magnetic chips collector with magnetized chips onto the scrap container and then release the chips by pulling up a lever of the permanent magnet block. The operator faces this difficulty just in doing a simple cleaning

procedure. If there is mass production and many of machines involved, the condition is more different. The operator needs more time and more effort for that.

Know that the cleaning procedure is very significant to sure the safety and productivity aspect, an Electromagnetic Chip Collector (EMCC) is one of alternative that can be used for metal chips cleaning.

1.2 Objectives

1.2.1 To modify and add electromagnet and motor drive features to the current manual magnetic chip collector (MMCC).

1.2.2 To develop a prototype of Electromagnetic Chip Collector (EMCC)

1.3 Scopes

The scope of this project will cover on the modification of some features on the existing Manual Magnetic Chip Collector (MMCC) and come out with a new prototype called Electromagnetic Chip Collector (EMCC). The modifications features will be analyzed and determined in Chapter 3.

The design work will include the application of modeling software to show clearly the modifications done. The fabrication of EMCC will also involve manufacturing processes and assembly before testing is conducted.

1.4 Significance of the Study

A kind of engineering student that heterogeneous in terms of excellence in academics, it is something wrong if they are not good in practically also. For this final year project involvement, they should be able to identify learning issues of the topic of project whether it is useful for the engineering world or not. That is based on what have students achieve from this project implementation.

According to the planning, for this project to be completed, students must absolutely use the knowledge of doing researching regarding the selected topic. It might be gained more when attempted to generate ideas of the project. Studying about the chips formation gives the understanding of how the problem comes and how it going to be solved.

The EMCC give better solution of cleaning method in machining work area. The study about magnetism and electromagnet are the main recipe of this project accomplishment. Besides, the manufacturing processes are needed to be sharpened in terms of its skill and the basic element of electrical knowledge. In designing a good concept of prototype it is necessary to achieve the best perception of the evaluator at the end of the project. This is the opportunity for student to evaluate how they use of their study in engineering over the years in the university level.

In addition, for the good of engineering people out there, the well functioning of EMCC prototype is very useful especially for safety environment in working area in terms of improvement on the current manual method, giving more effective utilization, ease and practical for the operators, and low cost effect that helps the productivity in industry.

1.5 Conclusion

In reviewing the needs of this project that been specified, this project will give an opportunity to students to show their abilities and gain variety of engineering skill especially in conducting a beneficial project. To get this project according to plan, and follow the schedule and needs, all the methods and techniques that concern to be followed until the end of project.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This is the body section of the entire text that aims to review the critical points of current knowledge on the topic of project. It is used to form the justification for future research in the area. A literature review consists of current and relevant references with consistent, appropriate referencing style and comprehensive view of the previous research on the topic actually. According to Cooper (1988), a literature review seeks to describe, summarize, evaluate, clarify and integrate the content of primary reports. Therefore, this literature review is completely done to narrate about what the understanding of relevant information to the EMCC.

2.1 Metal Machining Processes

Metal machining process can be described as removal of material from a workpiece, it covers several processes, which we usually divide into the following categories:

- Cutting, generally involving single-point or multipoint cutting tools, each with a clearly defined geometry.
- Abrasive processes, such as grinding.
- Nontraditional machining processes, utilizing electrical, chemical, and optimal sources of energy