

# **DESIGN OF NEW INTERLOCKING BRICKS MAKING MACHINE**

**MOHD RIDHWAN BIN RAMLI**

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To my beloved my wife Zariwani Zakaria, dedicated supervisor Associate Professor Zainal Abidin Ahmad, Tn. Haji Fadhil Ahmad, Tn. Haji Azhar Zubir, and Mr. Helmi Ahya Ilmuuddin . Thank for all your support .

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## **ABSTRACT**

This report presents a systematic approach to enhance the current design of interlocking brick machine. The design starts with data gathering from the literature review and information given by the interlocking bricks maker. Product specification is then being developed and refine to the specific points. The weaknesses of the current design are being analyzed by looking at the movement waste done by the machine operator and the machine limitation is being identified. The interlocking bricks are different from other normal bricks as it requires no mortar or cement for masonry work. This bricks interlocked with each other by means of positives and negative frogs on the top and bottom of the bricks which disallow the horizontal movement of bricks. Selection of best design is chosen from the several design concepts proposed. Finally, the drawing and detail design is produced according to standard and ready to be built by the machine developer.

## **ABSTRAK**

Kertas ini mempersembahkan penyampaian sistematik tentang bagaimana untuk menambahbaikan rekabentuk sedia ada bagi mesin membuat bata. Pengubahsuaian dan penambahbaikan mesin yang sedia ada adalah bertujuan untuk meningkatkan produktiviti pengeluaran bata. Langkah pertama untuk membuat rekabentuk baru bagi projek ini adalah mengumpul maklumat dengan membuat kajian ilmiah tentang rekabentuk sedia ada dan mengumpul maklumat daripada pengeluar bata tempatan. Kelemahan yang terdapat pada mesin sedia ada diuji dengan melihat pergerakan operator mesin dimana segala pergerakan yang membazir akan dikenalpasti untuk penambahbaikan. Had penggunaan mesin juga akan dikenalpasti untuk dilakukan proses yang sama. Bata yang dihasilkan oleh mesin ini adalah berbeza dengan bata yang lain kerana penggunaannya tidak memerlukan semen untuk dilekatkan antara satu sama lain. Bata jenis ini mempunyai kunci positif dan negative yang membolehkan ianya melekat sendiri tanpa menggunakan semen. Setelah beberapa konsep rekabentuk dihasilkan, Cuma yang terbaik akan dipilih untuk diteruskan dengan menghasilkan lukisan kejuruteraan mengikut piawaiannya dan sedia digunakan oleh pengilang untuk menghasilkan mesin ini.

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## LIST OF ABBREVIATIONS

CAE	-	Computer Aided Engineering
CATIA	-	Computer Aided Three-Dimensional Interactive Application
D	-	Bore Diameter
DfX	-	Design for Assembly, Manufacturing, and Environment
EDM	-	Electrical Discharge Machine
Kg	-	Kilogram
KN	-	KiloNewton
PDS	-	Product Design Specification
PLC	-	Programmable Logic Controller

## LIST OF SYMBOLS

$\pi$	-	pi (3.1415)
P	-	Pressure
$^{\circ}\text{C}$	-	Degree Celsius
$^{\circ}\text{F}$	-	Degree Fahrenheit

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Introduction**

No construction is possible without bricks. Since many centuries brick making has been practiced by human beings. Presently, bricks are easily made by using machines using new technologies. Generally two types of bricks are manufactured by using machines that are concrete block machines and clay brick machines. Different types of automatic machines use different techniques to make bricks. The raw materials used by the machines for making interlocking bricks are fly ash, sand lime, iron oxide, lime sludge, quarry wastes etc.

The focus of this project is on the production of concrete bricks, specifically interlocking bricks which offer a speedier, cost effective, environmentally sound alternative to conventional walling materials. It is based on the principle of densification of a lean concrete mix to make a regular shape, uniform, high performance masonry unit. Concrete Block Technology can be easily adapted to suit special needs of users by modifying some design parameters such as mix proportion, water to cement ratio and

type of production system. It is an effective means of utilizing wastes generated by stone crushers, quarrying and stone processing units. The technology has high potential in areas where raw materials are easily available. The new technique in producing this interlock brick can generate a highly profitable business for micro and small scale building material producers and construction companies. The market for this type of brick in Malaysia is not yet growing at a rapid rate, even though there are demands in construction industries due to low production rate which reflect the cost of brick itself.

### **1.0.1 Interlocking Brick Specification**

The interlocking bricks are different from other normal bricks as it requires no mortar or cement for masonry work. This bricks interlocked with each other by means of positives and negative frogs on the top and bottom of the bricks which disallow the horizontal movement of bricks. There are various application of this bricks namely; load bearing wall, lintels, sills, wall corners etc. The specifications and the characteristics of this brick depend on the machine used to manufacture it. The most common size of brick is 300x150x120mm. The basic raw material is cement, fine aggregate and coarse aggregate. Very little water is used. This is possible only with mechanized compaction and vibration and gives the block high quality in spite of the lean mix, which uses very little cement. Weight of this brick is about 2 - 3 Kg.



### **1.0.2 Production of Interlocking Brick Process**

Current process of producing the interlocking brick is produced using a semi-mechanized stationary type machine. The other production systems are - manual moulds that require hand tamping, a mobile semi-mechanized egg-laying machine and fully mechanized system that combines compression and manual concrete filling in mould. The machine also compacts and consolidates the mix so that the blocks are uniform in size and attain desired physical properties. The blocks are cured for a minimum period of 14 days, before they are ready to use. On an average 600-800 blocks can be in 8 hours by 1 skilled and 6-8 semi-skilled workers.

In this project, a high quality machines in which optimize from the current machine design is going to propose according to the feedback and the need from the interlocking brick maker.

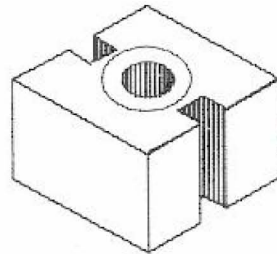
### **1.0.3 Types of Interlocking Bricks**

There are various types of interlocking bricks. The most commonly used cement interlocking bricks are;

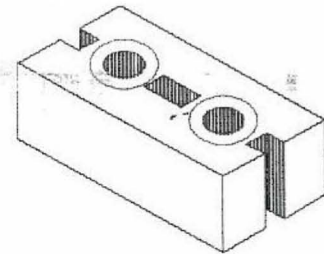
- i. Regular Shaped Brick
- ii. Half Size Brick
- iii. U-Shaped Brick

See figure 1.1 for types of interlocking brick

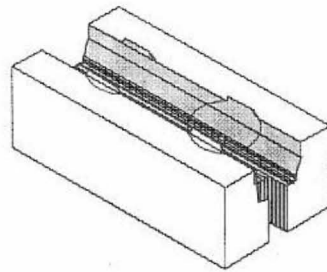
Half Size Brick



Regular Shaped Brick



U- Shaped Brick

**Figure 1.1:** Type of Interlocking Brick

## 1.1 Objective

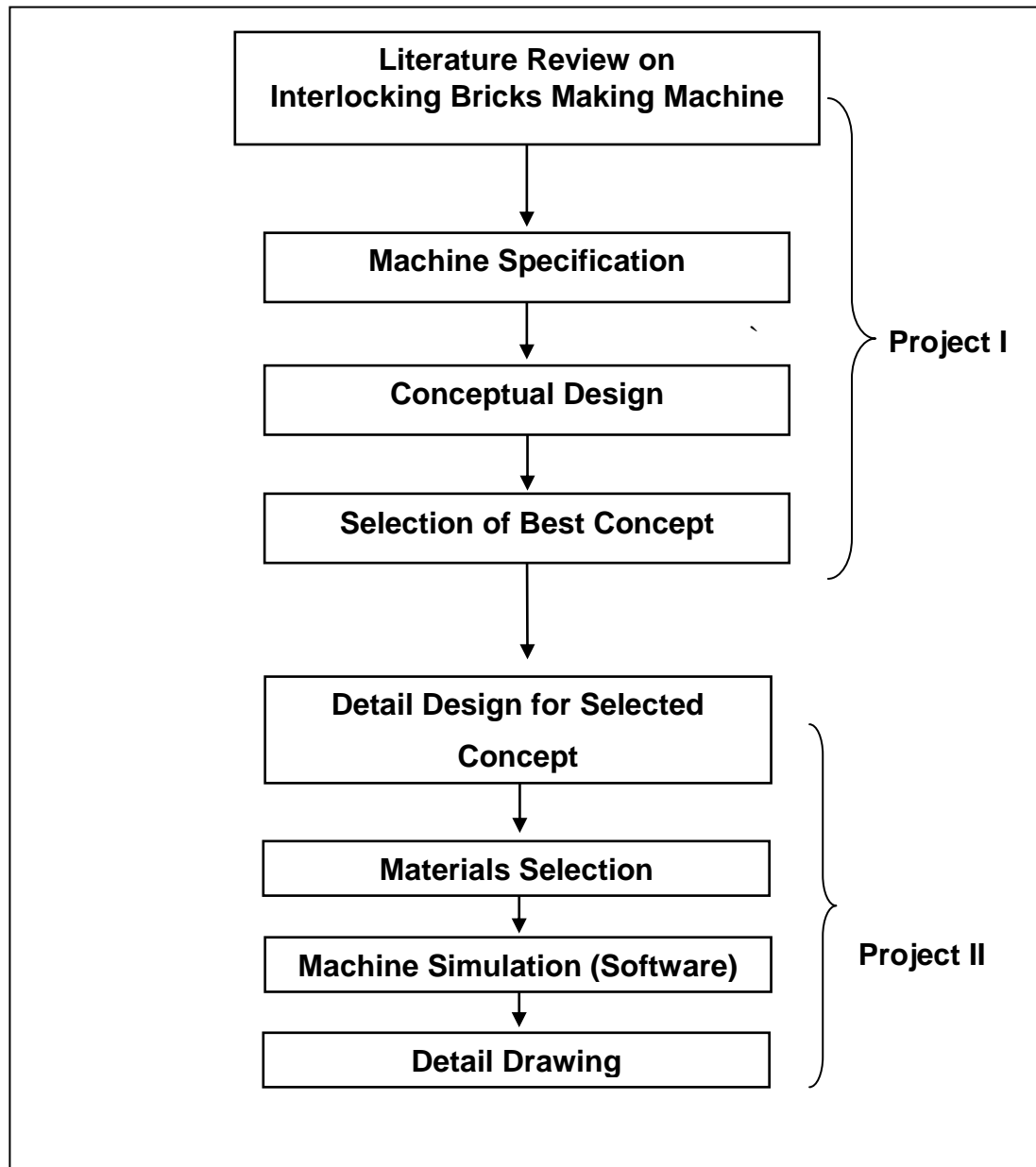
The main objective of this project is to design a new bricks making machine with new features and simplifying the machine for one man operation in order to reduced operational cost and maximizes the production rate. Furthermore, the purpose of this is to design the interlocking bricks making machine that suitable for SME entrepreneurs.

## 1.2 Scope of project

The scope of project is clearly define the specific field of the research and ensure that the entire content of this thesis is confined the scope. This project is start with the literature review on product specification in order to satisfy the project objectives. After obtaining the product specification, this project is done base on the scope below;

- Project will focus on interlocking brick making machine only.
- Designing the inter-locking brick making machine that fulfill the project objective.
- Machine design to suit the regular interlocking bricks (Figure 1.1).
- The project goes until detail design of interlocking brick making machine.
- The major output of this project is to produce the detail drawing for the machine design.
- Fabrication of machine is excluded in this project.

The scope of work can be described in terms of flowchart as per the following Figure 2.



**Figure 1.2:** Flow chart represents the scope of work