

**PICK AND PLACE ROBOT**

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**This report is submitted in partial fulfillment of the requirements for the award of  
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**Faculty of Electronic and Computer Engineering  
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## ROBOT ANGKAT DAN LETAK

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Laporan ini dikemukakan untuk memenuhi sebahagian daripada syarat penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Industri) Dengan Kepujian

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This project is dedicated to my father Mr. Ahmad Sabri Bin Che Daud. From all his support, I have been finished this thesis. Not forget also to all my family members especially my mother Wan Saidah Binti Wan Hassan and my entire relative. Next is to all of my friends especially my classmate. Last but not least to my supervisor Mr. Zulhairi Bin Othman.



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## ABSTRACT

The pick and place robot is one of the technologies in manufacturing industry and designed to perform pick and place functions. The system is very important to eliminate human errors and to get more precise work. It can also save the cost in long term and help to solve problems and tasks that cannot be done such as on high temperature area, narrow area and very heavy load thing. This project is a basic development and modification for that type of robot where it use the peripheral interface Programmable Logic Control (PLC) as the robot brain to control all of the robot movement. The rotation of this robot is 90 degree (clockwise) and -90 degree (counter clockwise). The arm will move horizontally to pick up and hold the bottles from base A and places it to base B. This robot is used to pick and place the bottles only in their specifications (between 250ml and 600ml). The benefit is the robot can pick the bottle without gripping the bottle but just hanging it to the gripper and the construction cost is inexpensive.

## ABSTRAK

Robot angkat letak merupakan salah satu teknologi dalam bidang industri pembuatan. Robot ini di hasilkan adalah bertujuan untuk menunjukkan bagaimana robot angkat dan letak berfungsi dan beroperasi. Sistem ini amatlah penting bagi mengelakkan kesilapan manusia dalam melakukan sesuatu kerja dan untuk mendapatkan kerja yang lebih tepat dan jitu. Sistem ini juga akan membantu mengurangkan kos perbelanjaan jangka panjang dan membantu manusia menyelesaikan masalah terutamanya pada kawasan yang sukar dicapai seperti tempat yang bersuhu tinggi, tempat yang sempit dan bagi mengangkat beban yang terlalu berat. Ia merupakan pembinaan asas dan perubahan dalam jenis robot seperti ini di mana ia akan di kawal dengan menggunakan Programmable Logic Control (PLC) yang berfungsi sebagai otak untuk mengawal semua pergerakan robot ini. Robot ini hanya boleh bergerak dalam dua keadaan iaitu +90 darjah (mengikut arah jam) dan -90 darjah (melawan arah jam). Robot ini hanya bergerak secara melintang untuk mengangkat dan menahan botol dari tapak A dan meletakkan botol pada tapak B. Robot ini telah direkacipta khusus untuk mengangkat botol sahaja mengikut spesifikasi yang telah ditetapkan iaitu berat botol diantara 250ml dan 600ml. Kelebihan robot ini ialah ia dapat mengangkat botol tanpa menggunakan cengkaman tetapi dengan hanya menahan botol dan kos merekacipta robot ini juga adalah murah.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 BACKGROUND**

Pick & Place robots are used in a wide variety of material transfer applications. Basically, the machine takes a product from one spot in the manufacturing process and places it into another location. A good example is a robot picking items off a conveyor belt and placing them into packaging boxes.

The typical pick and place application requires high amounts of repetitive motion. Robots can eliminate human operation of hazardous tasks such as chemical spraying or heavy lifting. Pick and place robots have high return on investment when consistent shaped parts or containers are handled. Unlike human operators, robots also have the ability to work for an extended time.

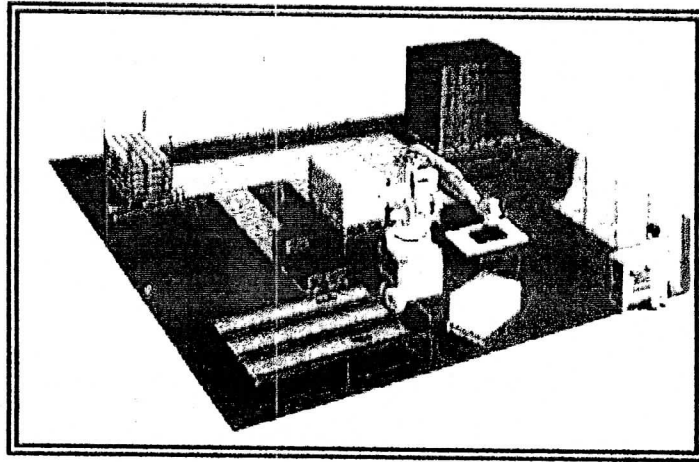


Figure 1.1: Typical Pick and Place Robot Work Cell

The typical pick and placed robot can only perform its function within its work cell as being shown in Picture 1. If a different shape of material is being used, the end effectors of the robot had to be changed as well to suit the material its handling.

## 1.2 OBJECTIVES:

In manufacturing industries, the pick and place robot was invented to be used as hardware to solving and accomplishing most of task that cannot be done by human being and also to be faster and pinch the production time.

For this project the main objective is:

- i) To study the concept on how pick and place robot function and operate.
- ii) To design the hardware for pick and place robot.
- iii) To design the software for pick and place robot using the Programmable Logic Control (PLC).
- iv) To design the combination of pneumatic and motion system.

### **1.3 SCOPE**

In order to design successful pick and places robot, scopes are required to assist and guide the development of the project. The scope should be identified and planned to achieve the objective of the project successfully on the time. The scopes for this project are:

- i) To design a program that controls the robot movement.
- ii) To design and fabricate the mechanical structure for the robot.
- iii) To loading and unloading bottles between 250ml and 650ml.

### **1.4 BENEFITS OF THE PROJECT**

1. It can show about the application among the PLC.
2. Eliminate the usage of human power to pick up things.
3. Prevent back pain/back injuries due to picking up heavy loads by the operator.
4. Increase productivity and efficiency.

### **1.5 PROBLEM STATEMENT**

This picks and place robot being designed to ease the sorting process of heavy materials. Usually the transfer process of the heavy materials is being carried out using man power and if the transfer process is repeated for a period of time, it can cause injuries to the operator. By using this particular robot, the operator will no longer have to bent and lift up heavy loads thus preventing injuries and increasing the efficiency of the work. Operator will make mistakes whether small or big every one in a while .In the industrial world, the industry cannot afford to take kind of mistakes. Every mistake is costly whether in time, money, and material.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Type of Pick and Place Robots

##### 2.1.1 Hybrid Pick and Place Machine

In this paper we present a constructive heuristic to optimize the component pick and place operations of a hybrid pick and place machine, which is a new type of surface mount device placement machine. Since a nozzle change operation is very expensive (it significantly adds to the overall assembly time), the heuristic gives highest priority to minimizing the number of nozzle changes. The ordered nozzle selection heuristic begins by choosing the best nozzle pair that is most effective for picking and placing components onto the printed circuit board (PCB) [1]. Next, we schedule all pairs of PCB points, that are expecting components from the chosen nozzle pair. Then, the nozzle pair's arc is re-ranked based on the availability of component feeders and the PCB points that need to be scheduled. Again, the best nozzle pair is chosen and the previous steps are repeated. When none of the selected nozzle pairs can pick and place two components in a sub tour, we schedule the one component sub tour.