# Wireless Production Monitoring System Using Zigbee

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Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer

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To my beloved mother and father

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## ABSTRACT

This project is improvement of production monitoring system, which is rarely used nowadays in industry. Manual system and connection using wire give more disadvantages than advantages. Therefore, the improvement is about changing the manual system to an automatic system and the wire system into the wireless. This automated system can improve data accuracy and reliability. As the manual system, usually the data accuracy will be low because of human occur. Using automated system will reduce or minimize human errors. Furthermore, another improvement is about the connection from using wire to wireless connection. Using wireless, many problems can be solved such as cost and maintenance problem. Data transfer can be done wirelessly. It is hard to define and troubleshoot errors occurred in a wired system as compared to a wireless system. This project consists of IR sensor, switch (timer), PIC microcontroller (16F877A), Zigbee and LCD display. It will monitor the total production, total reject and total downtime at production line. Wireless range for this project is about 10 – 100 meter and it is quite enough to support the connection between the PIC microcontrollers.

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# ABSTRAK

Projek ini ialah penambahbaikan sistem pengawasan pengeluaran, yang jarang sekali digunakan pada masa kini dalam industri. Sistem manual dan sambungan menggunakan wayar memberi lebih keburukan daripada kelebihan. Lantarannya, penambahbaiakn tentang mengubah sistem manual kepada satu sistem automatik dan sistem wayar kepada system tanpa wayar. Sistem automatik ini boleh memperbaiki ketepatan maklumat dan kebolehpercayaan. Sebagai sistem manual, biasanya ketepatan maklumat akan menjadi rendah kerana kesalahan manusia. Menggunakan sistem automatik akan mengurangkan kesilapan manusia. Tambahan pula, penambahbaikan lain adalah berkaitan dengan penyambungan menggunakan wayar ditukat ke penyambungan tanpa wayar. Menggunakan penyambungan tanpa wayar, banyak masalah boleh diselesaikan seperti menelan belanja dan masalah penyelenggaraan. Pemindahan data boleh dibuat secara sambungan tanpa wayar. Sukar untuk mentakrifkan dan menyelesaikan masalah kesilapan berlaku di satu sistem berwayar seperti yang dibandingkan dengan satu sistem tanpa wayar. Projek ini terdiri daripada penderia IR, menukar, mikropengawal PIC, Zigbee dan paparan LCD. Ia akan memantau jumlah pengeluaran, jumlah barang yang ditolak dan masa kerosakan di produksi. Jarak sambungan tanpa wayar bagi projek ini ialah kira-kira 10 - 100 meter dan ia agak cukup menyokong sambungan antara mikropengawal PIC.

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## LIST OF ABBREVIATION

| | | |
|---|---|---|
| FYP | - | (final year project) |
| IR | - | Infrared |
| PIC | - | Peripheral Interface Controller |
| LCD | - | Liquid-crystal display |
| LAN | - | Local area network |
| WAN | - | Wireless area network |
| ROM | - | Read only memory |
| IEEE | - | Institute of Electrical and Electronics Engineers |
| CSMA-CA | - | Carrier sense multiple access with collision avoidance |
| GSM | - | Global System for Mobile Communications |
| I/O | - | Input output |
| LED | - | Light emitting diode |
| MAC | - | Media access control |

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# CHAPTER I

# INTRODUCTION

This chapter will discuss about the overview of process that involved in wireless production monitoring system using zigbee. It discuss about objectives, problem statements and scope of work of this project. The end of this chapter will list the report structure.

## 1.1 Project summary

Wireless production monitoring system is a system that contains sensor, microcontroller and XBee module. The system will help user to monitor the production line and the process that involves in that production line. From the

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improved system, it will increase the accuracy and the reliability of the process. With using the IR sensor, the system will automatically count the product.

Moreover, this project is proposed due to the XBee module that can cover longer distance, more secure and reliable as compared to the using other wireless device like Bluetooth that can transfer data in limited and short distance. This system is really easy to use, and simple method. At the end of the project, a reliable and robust monitoring system using XBee module is expected to be developed.

## 1.2 Problem Statement

There is many methods that company use to observe, investigate, and many more to collecting the data for the output product. Usually they use the manual monitoring to measure the production line efficiency, reject and downtime. The examples of the manual monitoring are data entry and manual inventory. Manual monitoring prone to error especially human errors and data adjustments. These manual activities incur costs and time consuming.

Another problem with the monitoring nowadays is about using the wire connection monitoring. When using wire connection, there are many problems that occur for example the range or the limits of the cable are limited. In addition, while using wire, the wiring issues will occur such as hard to do maintenance and also hard to do troubleshooting because of the wire is scattered. However, the problem can overcome it by using wireless production monitoring system using zigbee.

Using this system monitoring, it will provide the automatic system that monitoring all the process of the production line that is involve. Using the sensor, it will automatically count the product automatically and easer user to

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monitor. Moreover, it is using the wireless system that using the zigbee technology that will overcome the entire wire connection problem.

## 1.3 Objectives

There is several objectives that need to be archived, these objectives this project are:

1. To design an automated production monitoring system using PIC, LCD, sensor and Timer.
2. To develop a wireless production monitoring system using Zigbee technology.
3. To analyze the performance of the whole system.

## 1.4 Scope of Works

The scopes of work in this project are:

1. This project consists of IR sensor, PIC microcontroller 16F877A, LCD, and timer.
2. The wireless technology using the Zigbee technology.
3. Function of the component or the operation flow for the circuit:
    a. IR sensor 1 is used to detect total product, IR sensor 2 is used to detect reject product and IR sensor 3 is used to detect good product.
    b. Switch is used as a timer for downtime machine
    c. IR Sensor 1, 2, 3 and switch is connected to the PIC 1.
    d. PIC1 is used as a counter and timer that will connect to the PIC2 through the XBee module using transmitter and receiver.
    e. PIC2 is connected to the LCD and will display the overall total production, the reject product, the good product and the downtime machine.

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4. Time interval system to transmit data from transmitter to receiver is in every minute.
5. The range for the wireless is about 10-100m surround in the free space.
6. The project can run only in the line process.

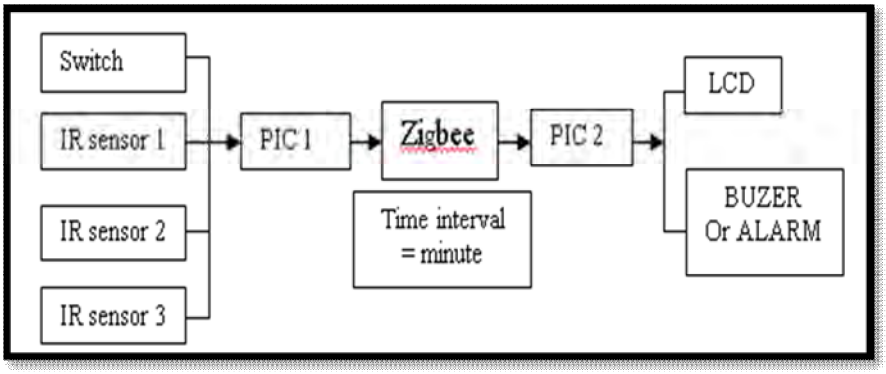


Figure 1.1: block diagram for system operation.

## 1.5 Methodology's Summary

Methodology discusses about the process and the method that were used to complete the project. Before start the project, all the necessary steps have been taking into consideration to avoid any unwanted situation from occur. First off all about the design initial circuit or system. In this step, searching and analyze the information will be needed by doing research about the pass journal, searching information about the system in the website, understand about the component that involve, and understand more about the system. So, refer to the information that are collected and start design the circuit and the system. After that, design program for PIC. To design the program, software PIC-C or CCS-C will be use. The design will be separated in two parts. The first one is for the PIC one which is for the control system and the counting. The second PIC is for the display in the LCD. After complete the program, simulate the entire program by using proteus software. Then, Interface PIC with XBbee and LCD monitor. Troubleshooting will be need if there is any errors occur. This step

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maybe takes longer time to fix the entire problem and make the circuit to fully function. At last, testing and analyze the whole system.

## 1.6 Report Structure

This final year report will discusses overall about the wireless monitoring system using zigbee. The report is divided into five chapters which cover all the matters that should be discussed in the developing of this project.

The first chapter for this report is introduction. In introduction, it will have a few of sub-topics, which are background study, objective, problem statement, scope of project, and methodology. In project background, it will discuss about the application of the project. In the problem statement sub-topic it will be explained what was the problems found in the production line that will be explained. Then, the purpose of this project will be clearly explained. In order to achieve the objective of this project some scope of work has been determined and described clearly in sub chapter of scope of work.

Chapter two will be covered the literature review. It is about the study on the component that will be used, the theory of the project and the case study of the previous projects. Besides that, the literature review also covered about article, book, or research that related to this project.

Next chapter is methodology part. This part will explain about some of the guidelines for this project and also clearly mentioned steps that should be taken for this project. It shows the step to achieve the main objective in this report.
Chapter four is about the result and discussion of the project. Besides that, the performance and analysis of the result obtained is also included in this chapter.

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The last chapter for this report is conclusion. In this part, the achievement of project objectives will be concluded . Some recommendation will be shown in this chapter and for future improvement.

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# CHAPTER II

# LITERATURE REVIEW

This chapter will discuss about all the source of the project or the articles that are related also the previous journal that can be guidelines for the project. In the market, maybe there is some of product that has a bit similarity to product have been release that will be referred. Moreover, this chapter also will explain about the component and programming language that is used during development of the project.

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