

**ANDROID BASED WIRELESS CONTROL VALVES FOR CHEMICAL PLANT
INDUSTRIES**

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DEDICATION

Firstly, I would like to specially dedicated to my main supervisor Mr. Nor Azlan Bin Mohd Aris and my co-supervisor Mr Ahmed Fayeez bin Tuani Ibrahim who give me a lot of guidance and advices throughout this project until successful. Under their guidance and helps, I have successful developed and achieved the completion of this project.

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ABSTRACT

Today most people used android platform to control devices in their daily life. Android platform has been widely established and mostly used among smart phone users compared to other platform. Mobile phones or smart phones are not just to make calls. The functions of smart phones is grow up with the development of technology and they can be used for other purposes. Nowadays, the smart phones can be implement without any further development or en-hancement. By using bluetooth as a communication module, a smart phone can be used to control other device such as valves either we want to turn on or off. Most chemical industries such as PETRONAS, Talesman, and etc using valves to drain the petroleum waste into the tank. Nowadays, they are using remote control as a medium to control the valve. It is still using wireless as communication module between the valves and the controller. This project has been initiated with the motivation to assist engineers in physical devices controlling or to improve the efficiency in plant industries management system which is known as Android Based Wireless Control Valves for Chemical Plant Industries. Therefore, this project aims to create an android platform that is cheaper, more efficient and user friendly to control valves. The Bluetooth module and the Arduino Uno Board are used to communicate between the mobile phones and the valves. There are limitation in this project which is the system is limited with the distance of Bluetooth module.

ABSTRAK

Hari ini kebanyakan orang menggunakan platform android untuk mengawal peranti dalam kehidupan seharian mereka. Platform Android telah banyak ditubuhkan dan banyak digunakan di kalangan pengguna telefon pintar berbanding platform lain. Telefon bimbit atau telefon pintar tidak hanya untuk membuat panggilan. Fungsi telefon pintar membesar dengan perkembangan teknologi dan mereka boleh digunakan untuk tujuan lain. Pada masa kini, telefon pintar boleh melaksanakan tanpa apa-apa pembangunan atau penambahbaikan selanjutnya. Dengan menggunakan bluetooth sebagai modul komunikasi, telefon pintar boleh digunakan untuk mengawal peranti lain seperti injap sama ada kita mahu menghidupkan atau mematikan. Kebanyakan industri kimia seperti PETRONAS, Talisman, dan lain-lain dengan menggunakan injap untuk mengalirkan sisa petroleum ke dalam tangki. Pada masa kini, mereka menggunakan alat kawalan jauh sebagai medium untuk mengawal injap. Ia masih menggunakan modul komunikasi tanpa wayar antara injap dan pengawal. Projek ini telah dimulakan dengan motivasi untuk membantu jurutera dalam peranti fizikal mengawal atau untuk meningkatkan kecekapan dalam kilang industri sistem pengurusan yang dikenali sebagai Android Berasaskan Wireless Injap Kawalan untuk Loji Kimia Industri. Oleh itu, projek ini bertujuan untuk mewujudkan platform android yang lebih murah, lebih cekap dan mesra untuk mengawal injap pengguna. Modul Bluetooth dan Arduino Uno digunakan untuk berkomunikasi antara telefon mudah alih dan injap. Terdapat had dalam projek ini iaitu sistem dihadkan dengan jarak modul Bluetooth.

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LIST OF ABBREVIATIONS

IDE	Integrated Development Environment
SCADA	Supervisory Control And Data Acquisition
VRA	Variable Rate Application system
HP	Horse Power
CFM	Cubic Feet associated with air flow every Minute
LPAs	Low-pressure air compressors
HPAs	High-pressure air compressors
AC	Alternate Current
DC	Direct Current
RTUs	Remote Incurable Models
USB	Universal Serial Bus
SPI	Serial Peripheral Interface
CMOS	Complementary Metal Oxide Semiconductor
RISC	Reduced Instruction Set Computer

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CHAPTER I

INTRODUCTION

1.1 Overview

Nowadays Arduino platform has been widely established and mostly used among smartphones users compared to other platform for example this platform used as a medium to control lamp, coffee maker and etc. This platform has been used because the hardware platform set up already, especially the fact that it allows programming and serial communication over USB. This saves us the trouble of having to do our own PCB (which can cost more than an Arduino) or breadboarding either way takes time to do and verify that everything is working correctly. Mobile phones or smart phones are not just to make calls.

The functions of smart phones is growing up rapidly in line with the development of technology and they can be used for other purposes, be it virtually, or physically. Nowadays, the smart phones can be implement without any further development or enhancement. With the help of the Bluetooth module, a mobile can be used to implement a smart system by controlling the valves. By using Bluetooth module as a communication module, a smart phone can be used to control physical devices such as valves, lamp, devices and many thing either we want to turn on or off. Most chemical industries such as PETRONAS, Talesman, Slumberger and etc using valves to drain the petroleum waste into the tank.

Nowadays, they are using remote control and computer as a medium to control the valve. It is still using wireless as communication module between the valves and the controller. Suggestion, this project has been initiated with the motivation to assist engineer in physical device controlling or to improve the efficiency in chemical plant industries management systems known as Android Based Wireless Control Valves for Chemical Plant Industries. Therefore, this project aims to create an android platform that is cheaper, more efficient and user friendly to control valves. The bluetooth module and the Arduino Uno Board are used to communicate between the mobile phones and the valves. There are limitation in this project which is the system is limited with the bluetooth module distance constraints.

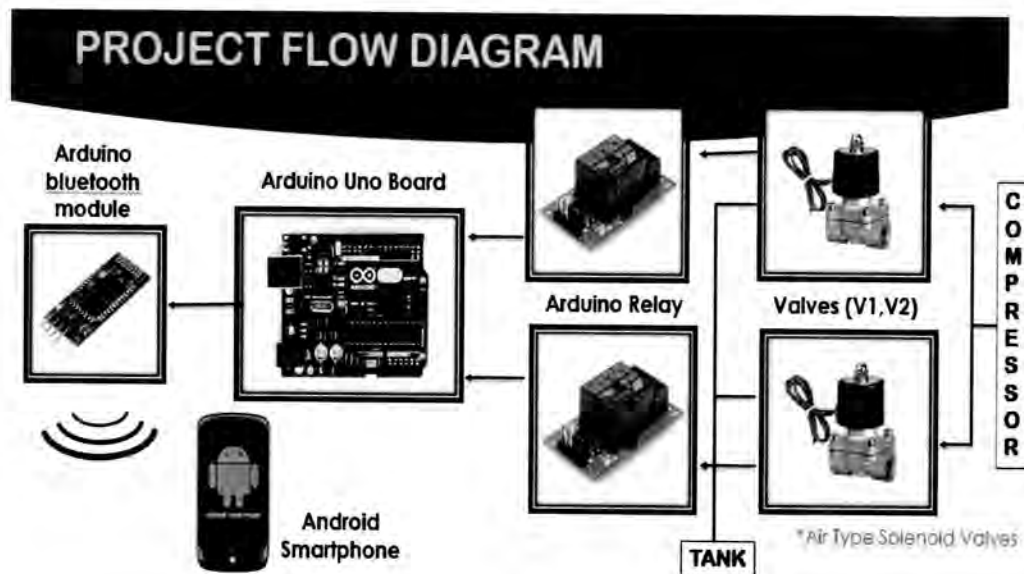


Figure 1.1 : Project Flow Diagram

1.2 Problem Statement

A valve is the main device in chemical industries that are used to drain the petroleum or chemical waste into the tank. Wireless control valves is very useful for engineer to turn on and turn off the valves from various place and anytime. Currently, these valves system uses wire as the communication module, it will increase the cost of the construction and increase the usage of wire besides increasing the cost for maintenance.

According to The Rain Bird CYCLIK wireless control system, there is already have a wireless control system to control the valves but it is not using android platform. If the engineer is left office and having outside work, they still can access to control the valves either they want to turn on or off. By using this kind of platform, the engineer can access

to control valves from various place. However, the system is limited to the area with the Bluetooth module distance constraints.

1.3 Objective

The main objective for this project are :

- 1) To design an android platform for wireless control valves for chemical plant industries.
- 2) To build a simple inexpensive android application to control valves.
- 3) To analyze the performance of the wireless control valves using android based compared to the current system used.

1.4 Scope

To improve efficiency in valves controlling, this android based wireless control valves for chemical plant industries design able to remotely control the valves even far from the valves location. So that, the user can access from various place to control the valves. Therefore, the alternative way of this case are android based wireless control using a modem., there is still have a limitation for this project which is the Bluetooth module distance. The microcontroller used in this project is Arduino Uno.

The Arduino platform was designed to create devices that interact with their environment using sensors and actuators. There are various types of Arduino controller board available in the market including the Arduino kits and Arduino shields. Arduino IDE software and HyperTerminal software is been used in this project. The Arduino Uno Board act as a controller to control the valves in term of switch on and off only. Limitation in term of budget and timeframe so, the project cannot be too complex and expensive.

1.5 Expected Output

After completing the prototype, the result from the project compared to analysis of the efficiency of the wireless system used. The expected results from this project are the valves in the hardware can be control by using android application. Then design the android based wireless control valves for chemical plant industries to achieve the following :

- 1) To design an android platform for wireless control valves for chemical plant industries.
- 2) To build a simple inexpensive android application to control valves.
- 3) To analyze the performance of the wireless control valves using android based compared to the current system used.

The systems used will reduce the cost for the construction, reduce the cost for the maintenance and reduce the usage of wire, besides that it is also easy to maintain.

CHAPTER II

LITERATURE REVIEW

2.1 The Research of Valves



Figure 2.1 : Type of Valves

Valves are mechanical devices that control the flow and pressure within a system or process. They are essential components of a piping system that conveys liquids, gases, vapours, slurries etc. Different types of Valves are available: gate, globe, plug, ball, butterfly, check, diaphragm, pinch, pressure relief, and control Valves. Each of these types has a number of models, each with different features and functional capabilities. Some Valves are self-operated while others manually or with an actuator or pneumatic or hydraulic is operated.

Functions from Valves are stopping and starting flow, reduce or increase a flow, controlling the direction of flow, Regulating a flow or process pressure and Relieve a pipe system of a certain pressure There are many Valve designs, types and models, with a wide range of industrial applications. All satisfy one or more of the functions identified above. Valves are expensive items, and it is important that a correct Valve is specified for the function, and must be constructed of the correct material for the process liquid.

2.1.1 Classification of Valves

The following are some of the commonly used Valve classifications, based on mechanical motion. Linear Motion Valves. The Valves in which the closure member, as in gate, globe, diaphragm, pinch, and lift Check Valves, moves in a straight line to allow, stop, or throttle the flow. Rotary Motion Valves. When the Valve-closure member travels along an angular or circular path, as in butterfly, ball, plug, eccentric- and Swing Check Valves, the Valves are called rotary motion Valves. Quarter Turn Valves. Some rotary motion Valves require approximately a quarter turn, 0 through 90°, motion of the stem to go to fully open from a fully closed position or vice versa.