SMOKE OPACITY METER VIA GSM

MOHD AZHAR BIN RAMLI

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Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : SMOKE OPACITY METER VIA GSM

Sesi Pengajian : 1 2 / 1 3

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NUR FATIHAH BTE AZMI
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Hang Tuah Jaya
76100 Durian Tunggal, Melaka

Tarikh: 12/6/2013

Tarikh: 12/6/2013

DECLARATION

"I hereby, declare this report entitled "Smoke Opacity Meter via GSM" is the result of my own research except as cited in references.

Signature : .....

Name : **MOHD AZHAR BIN RAMLI**

Date : 12/6/2013

APPROVAL

This report is submitted to the Faculty of Electronic Engineering and Computer Engineering (Electronic Telecommunication) of UTeM as a partial fulfilment of the requirement for the degree of Bachelor of Electronic Engineering (Telecommunication) (Hons.). The member of the supervisory committee is as follow:

NUR FATIHAH BTE AZMI
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Hang Tuah Jaya
76100 Durian Tunggal, Melaka.

(Official Stamp of Supervisor)

DEDICATION

Specially dedicate to

My beloved family, lecturers, supervisor and friends who have guided and inspired me through my journey in education. Also thanks to their support, beliefs and motivation.

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ABSTRACT

The purpose of this project is for design Smoke Opacity Meter via GSM. In this research, smoke opacity meter integrated with Global System for Mobile Communication (GSM) was designed. This research also will cover on implementation and technique use in measuring the level of smoke opacity where the analogue signal received by microcontroller from receiver. Then the microcontroller will be process the signal. If the microcontroller detects any signal exceeds set point, it will trigger an SMS notification to technician through GSM network. Besides that, systems compartment also have been designed to ensure the circuit and other component in the system not affected by heat or dust.

ABSTRAK

Tujuan projek ini adalah untuk mereka bentuk Meter Kelegapan Asap melalui GSM. Dalam kajian ini, meter kelegapan asap yang digabungkan dengan Sistem Global untuk Komunikasi Mudah Alih (GSM) telah direka. Kajian ini juga akan meliputi mengenai pelaksanaan dan penggunaan teknik dalam mengukur tahap kelegapan asap di mana isyarat analog diterima oleh mikro pengawal dari penerima dan mikro pengawal akan memproses isyarat. Jika mikro pengawal mengesan apa-apa isyarat melebihi tahap yang telah ditetapkan ia akan menghantar notifikasi berbentuk Khidmat Pesanan Ringkas (SMS) kepada juruteknik melalui rangkaian GSM. Selain itu juga, perumah bagi system juga telah direka untuk memastikan litar dan komponen lain di dalam system tidak terjejas oleh haba atau pun debu.

TABLE OF CONTENT

CHAPTER II: LITERATURE REVIEW

CHAPTER III: METHODOLOGY

CHAPTER IV: RESULT AND DISCUSSION

CHAPTER V: CONCLUSION AND SUGGESTION

LIST OF FIGURE

LIST OF TABLES

LIST OF ABBREVIATION

GSM	-	Global System for Mobile Communications
Tx	-	Transmitter
Rx	-	Receiver
SMS	-	Short Message Service
U-V	-	Ultra Violet
LED	-	Light Emitting Diode
LDR	-	Light Dependent Resistor
LCD	-	Liquid Crystal Display
PIC	-	Peripheral Interface Controller
AT	-	Attention
IC	-	Integrated Circuit
CPU	-	Central Processing Unit
SIM	-	Subscriber Identity Module

CHAPTER I

INTRODUCTION

1.1 Background of project

Nowadays industrial sector has been growth rapidly. Establishment of industrial factory in variety of services such as automobile, electronics, chemical, food, textile and others will provide more job opportunity and will result anestablish new city with the increasing of population within the years. Industrial factory especially during the process of their production will release chemicals, gases or smoke from the burning waste. This situation can cause serious air pollution if not being controlled in an effective ways and in the end will cause damage to nature and endangered our flora and fauna.

Air pollution can be defined as the existence of one or more pollution substances in the atmosphere for instance the quantity of dust, smoke, gas and vapor after it take a period of time itthat may hurt and damage to human's health, plants, animal and materials.

Smokeless flaring is one of the common requirements for industrial factory to ensure proper combustion and minimize air pollution. Minimum requirement of smokeless flaring is determined by local authority or company policy.Which color smoke is most hazardous to healthis not clear. The Environmental Department cares more about the opacity of smoke than its color. A thick, opaque smoke tends to contain more polluting particles than one had seen through, whether it's white or black. The Environmental Department used color as an index of opacity. Smoke plume came out from a chimney has been checked against a "Ringelmann chart" which tells how to convert shades of gray into percent opacities.Based on Environmental Quality Act (act 127) "Environmental Quality (clean air) 1978" Additional Federal Legislation. Section IV, Rules 14: Limit Black Smoke Authorization,onshore plant required Ringlemann 0 or 0 % (normal operation) and Ringlemann 5 or 100% (Emergency) [7].

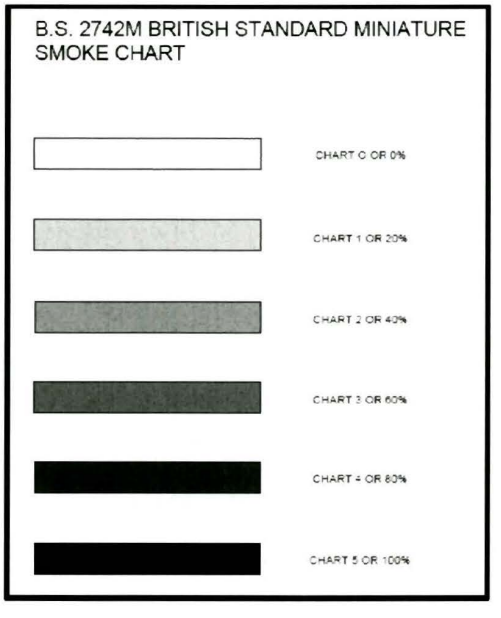

Figure 1.1: Ringelmann Smoke Chart [6]

In this project, a design of a system that measure the opacities of smoke emission from industrial factory automatically convert shades of gray into percent opacities based on Ringelmann Smoke Chart and following rules of Environmental Quality Act has been developed.This system consists of light source (Tx) and light sensor (Rx) that will be installing on opposite sides of the chimney with light beam focused from source side to the sensor side. Smoke passing through the light beam reduces intensity being received by the sensor. The initial intensity of the light is set and any reductions in that intensity, caused by particulate suspended in the chimney, are measured as opacity. This system will be integrated with the Global System for Mobile Communications (GSM) modem and it will trigger a notification of Short Message Service (SMS) to technician who responsible for maintenance factory combustion system if the system measures the opacity of smoke exceeds allowable limits. With the system that provides a real-time notification, it increases the response time of the technician to maintain the combustion system because improper combustion system and combustion filtering system generally causing the smoke emission in high opacity.

1.2 Objective Project

Air pollution is a problem that has long struck. A manual measurement of smoke opacity by using smoke chart will obtain unsatisfying resultbecause it is affected by weather or human error. This method also cannot give a real-time notification which is controlling combustion system will help to detect early malfunction and easy to maintenance.This project is known as Smoke Opacity Meter via GSM and the objective is:

- To design a system that can measure the grayness smoke released and automatically converts to percentage of opacity.
- To design a system that will send notification SMSto technician mobile phone if the opacity level of smoke emissions exceeds allowable limit.

1.3 Problem Statement

Air pollution is mainly caused by the act of discharging dangerous substances in to the air space. Industries making use of thermal power plant, steel, mines, petro-chemicals produce harmful substances which are disposed in to the atmosphere. These kinds of pollution have already made enough changes in the ozone production layer of the atmosphere. This ozone layer is very important for protecting the earth from most dangerous U-V rays. Since this layer getting thinned because of the global warming it affects the human lives in a great way. In addition, smoke emission without following the Quality Act (act 127) "Environmental Quality (clean air) 1978" can convicted by Environmental Department where each premises or individual can be fined RM10 000 or imprisonment at least two years or both [7]. Besides that, continuous emission without following Environmental Qualitycan cause discomfort and maybe harmful to humans and the environment.

1.4 Scope of project

In order to achieve the objective of this project, a scope of work had been divided into three parts which is software, hardware and area covered. Before fabricating process, the circuit that had been designed will be simulated using the suitable software. In this project, Proteus 7 Professional software had been used to simulate the circuit designed. Proteus 7 professional is a smart software tool which can be used extensively in a hardware design. For the hardware part, the circuit that has been designed, it will be fabricated. The circuit will be usedLight Emitting Diode (LED) as transmitter, Light Dependent Resistor (LDR) as receiver, Liquid Crystal Display (LCD) and GSM device and other components. The whole system will be control by the microcontroller provided by the Microchip Company which is PIC16F887A. The microcontroller also controls other interface with GSM device. For the area covered, it will be installed on opposite sides of the chimney with LED beamfocused to LDR.

1.5 Project Methodology

This project focuses more on study case and the project development based on the operation and behavior of LED and LDR.Microcontroller will continue to receive the analog signal (ex. voltage) from the receiver and automatically converted to a percentage of opacity. Before that, a predetermined set point in the microcontroller. Percentage will also be displayed on the LCD. When the microcontroller detects such percentage exceeds a predetermined set point, the notification SMS will send to a technician and technician will act to maintain the combustion systems in order to reduce air pollution. The project methodology shows the step by step taken in order to complete the project. The methodology includes the planning, the development of the design and the management of the project. The flowchart of project is shows on Figure 1.2.

1.6 Flowchart Methodology

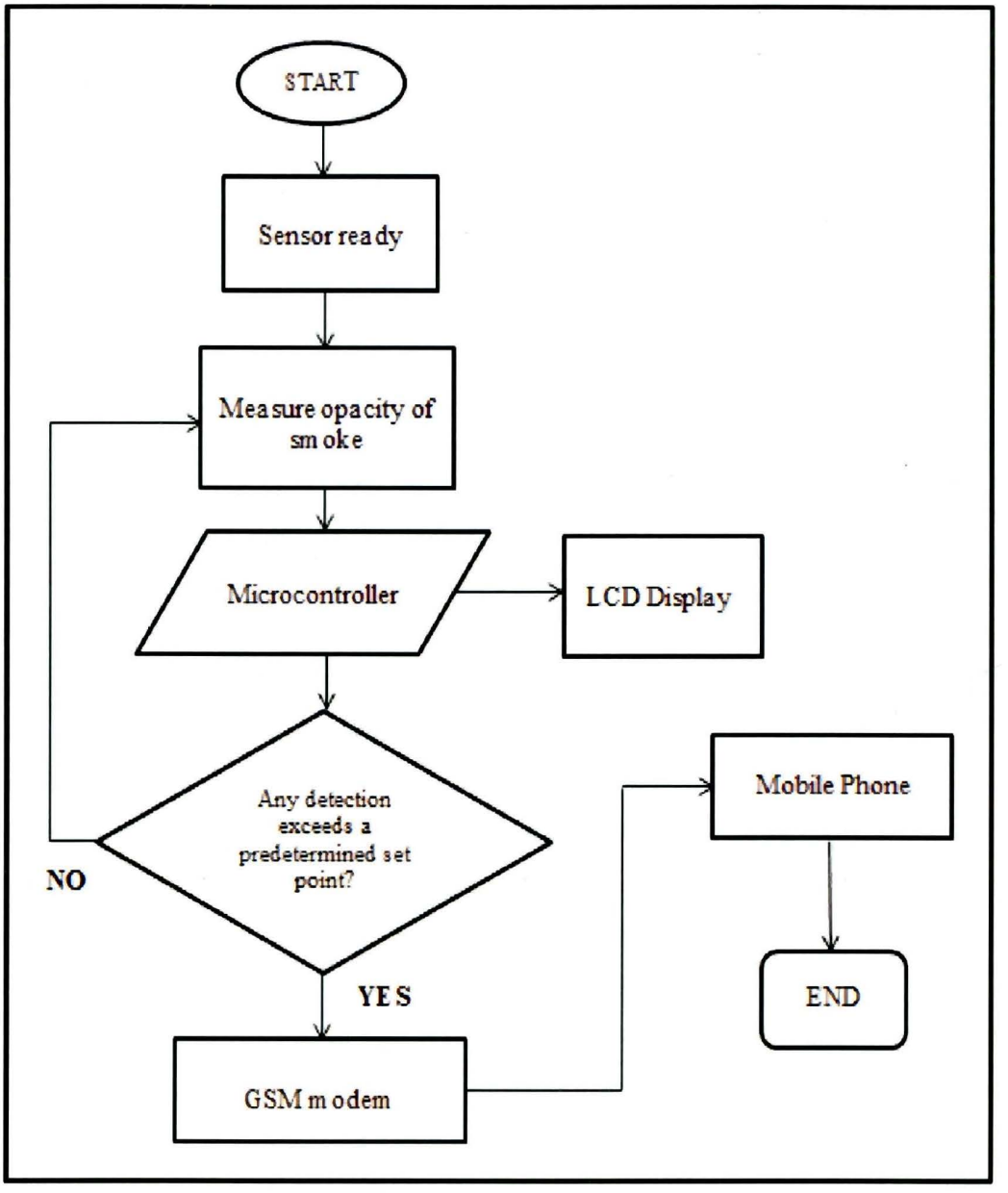

Figure 1.2: Flowchart of project

1.7 Report Structure

This report consists of five chapters. Chapter Istart with background study, introduction, problem statement, objective and scope of work. The literature review is presented in Chapter IIwhile project methodology in Chapter III. Chapter IV covers the result and discussion. Conclusions and suggestions are covered in Chapter V. In order to successfully implement the project, there are several areas to look into. The following are the main chapters and its short descriptions.

Chapter I: Study the objectives and scope of work on the project.
Chapter II: Literature review about a few techniques in measuring smoke opacity, Rules of Environmental Quality Act and hardware theory.
Chapter III: Project methodology includes the planning, development of the design and the management of the project.
Chapter IV: Result and Discussion
Chapter V: Conclusions and Suggestions on the project.

Dividing the project into various chapters is to ensure the project to work in a systematic and structural way such that the project able implemented smoothly.

Chapter I: Study the objectives and scope of work on the project.
The aim of this project is to design and develop a prototype of a system that can measure the percentage of smoke opacity that being released through chimney and give notification SMS to a technician through mobile phone via GSM if percentage of smoke opacity release exceeds allowable limit.

Chapter II: Literature review about a few techniques in measuring smoke opacity, Rules of Environmental Quality Act and GSM Infrastructure for Data Transmission.This chapter was research and read upon the relevant topics from sources such as reference books, patterns and journals to improve more knowledgeand provide more information and understanding on the project. Research has been done on a few techniques in measuring the concentration of smoke and selection the most effectiveways to get satisfies measurement and result. Besides

that, hardware theory including introduction and characteristics of main electronic component used in the prototype has been studied and analyzed.

Chapter III: Project methodology

This chapter will explain more about the project methodology that was used in the project. This part explained more about the project path from the beginning until it is completed. Every single thing that has been done in this project was explained step by step.

Chapter IV: Result and Discussion

The fourth chapter focused more on hardware development, programming on microcontroller, and Attention (AT) commands for GSM modem to send SMS. This chapter also shows about data measurement and data calibration. Discussion and analysis during testing process also included.

Chapter V: Conclusions and suggestions

The last chapter will review on the project, whether the implemented solution meet the objective of the project. Discuss on problems encountered, conclusions and suggestions will be discussed for the future improvements on this project.