This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electrical Engineering (Mechatronic) With Honours

Faculty of Electrical Engineering
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Title : **Automatic Control Room Temperature**
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Date : **12th May 2010**

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms scope and quality for the award of Bachelor of Electrical Engineering (Mechatronic) With Honours"

Signature : .....

Name : En.Ahmad Idil Bin Abdul Rahman

Date : 12th May 2010

"I hereby declare that this report is the result of my own work except for quotes as cited in the reference"

Signature : .....

Author : Muhamad Zubir Bin Omar

Date : 12th May 2010

1) Why do we fall?
So that, we can learn to pick ourselves up!
2) To be great man,
Must be great endeavours!.

ACKNOWLEDGEMENTS

All praises to Allah, we praise Him, asking the help and forgiveness from Him, we cover ourselves from our badness and also the disgusting of our actions. If anybody who given guidance from Allah, nobody can be losing him/her. If anybody who get lost from Allah, nobody can show him/her. I admitted that nothing can be pray with the right unless Allah, I also admitted that Muhammad saw is a slave and a messenger of Allah.

Amma ba'du,

Actually, the good words are Allah's. The good guides are Muhammad's saw. The filthy words are created; every created is new in Islam. Every new thing in Islam is lost and the place for every lost thing is the hell.

First of all, I want to thank to my parents who always support me from back and also support from finance aspect. I also want to thank to my supervisor, En.Ahmad Idil Bin Abdul Rahman who had given his advises and guidance throughout the two semesters while this project was done. I also want to thank my fellow friend, Mohd Hafiz Bin Taib and all persons who involved in this project.

Thank you!.

ABSTRACT

Technological developments affecting the system 'Microcontroller' allows people to control various activities and processes within the industry automatically. For this project, system Microcontroller is used to replace human labor in the regulation of temperature changes and notification of the status of a room as operating rooms machine etc. Conditions in a room can be identified when there is a sudden temperature increase or decrease due to operating a machine. Given this situation, a tool developed to control the status of the particular machine in the room whether it works properly or not through a temperature change in the room. Fan (fan eczos) operates automatically according to changes in room temperature. To detect changes in room temperature, a temperature sensor (type: LM35DZ) was used. This temperature sensor will send a signal to microcontroller (model: pic16f876a) and the microcontroller will determine the level of speed eczos fan either fast, medium and slow, and Strobe light on the signal received from the temperature sensor.

ABSTRAK

Pembangunan teknologi yang melibatkan sistem '*Microcontroller*' membolehkan manusia mengawal pelbagai aktiviti dan proses dalam industri secara automatik. Bagi projek ini, sistem '*Microcontroller*' digunakan bagi menggantikan penggunaan tenaga manusia dalam pengawalan perubahan suhu dan pemberitahuan status keadaan sesebuah bilik seperti bilik operasi mesin dsb. Keadaan di dalam sesebuah bilik dapat dikenalpasti apabila terdapat kenaikkan atau susutan suhu mendadak disebabkan pengoperasian sesebuah mesin. Berdasarkan keadaan ini, satu alat dibina untuk mengawal status keadaan terutamanya mesin di dalam bilik tersebut sama ada ianya berfungsi dengan baik atau sebaliknya menerusi perubahan (kenaikkan) suhu dalam bilik tersebut. Kipas (*eczos fan*) ini beroperasi secara automatik berdasarkan kepada perubahan suhu bilik. Untuk mengesan perubahan suhu bilik, pengesan suhu (jenis: LM35DZ) digunakan. Pengesan suhu ini akan menghantar isyarat pada mikropengawal (model: PIC16F876A) dan mikropengawal akan menentukan tahap kelajuan '*eczos fan*' samaada laju, sederhana dan perlahan serta '*Stobe light*' berdasarkan isyarat yang diterima daripada pengesan suhu.

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LIST OF ABBREVIATIONS

PCB	-	Printed Circuit Board
NTC	-	Negative Temperature Coefficient
AC	-	Alternate Current (Arus Ulang Alik)
IC	-	Integrated Circuit
DC	-	Direct Current (Arus Terus)
LED	-	Light Emitting Diode
SCR	-	Silicon Controlled Rectifier
ADC	-	Analog Digital Converter
PIC	-	Programmable Interface Circuit
PSM	-	Projek Sarjana Muda

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CHAPTER I

INTRODUCTION

1.1 Project Background

Each machine has a temperature of specific operations to enable it to operate properly. Instead of a machine that will over heat when they operate in a long time or have some damage. So this machine temperature rise will affect the surrounding temperature rise. So based on this problem, a prototype of automatic temperature control room was built to detect the rise in room temperature through the temperature of the machine. Prototype consists of two input sensors (LM35DZ) that will detect changes in temperature (range 35 ° C - 40 ° C) and then will send a signal to the Microcontroller (16F876A) is the 'brain' to be processed and output is eczos fan (5 VDC brushless fan) and strobe light as a signal.

1.2 Problem Statement

The problem statement of this project are:-

a) Room temperature measurement need some tool to replace measurement manually by human.
b) The capability of human is limited when they fill sleepy and tired.
c) A machine will low performance, overheat and may damage due increment of temperature.

1.3 Project Objective

Due to the problem statement stated above, it's cleared that the objectives of the project is:

1. To develop and implement an automatic control system and replace the manual control by human.
2. To built an accurate and sensitive circuit to control the room's temperature according to any changes of temperature. The suitable reference temperature is in the range of 35°C to 40°C.
3. To design a smart system of automatic control room temperature.

1.4 Scope Of Work

This project will focus on controlling temperature changing inside a room and speed changing for the fan. Thus, the function and operation of temperature sensor (type: LM35DZ) and microcontroller PIC16F876A will be study to complete this project. Others scope are software development and integration of both hardware and software in term to successful design. Figure 1.1 shows the system block diagram of main components in the project. There are two inputs system which is temperature sensor. This input will be controlled by microcontroller to perform the outputs. The description of each of the system such below:

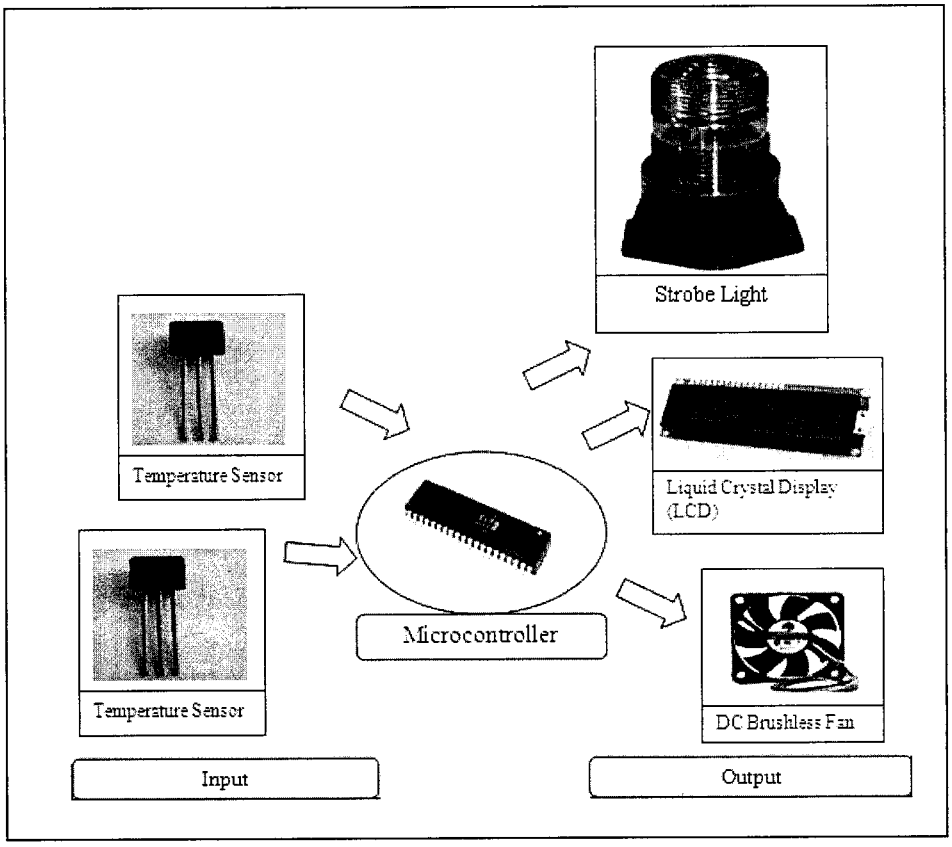

Figure 1.1 System Block Diagram

(i) Temperature Sensor

This temperature sensor will senses any changing of room temperature. The measurement range for this sensor is 0°C to 100°C and the reference temperature is 25°C. In addition, output of this sensor is fixed at 0V at 2°C. Output of this sensor increase at 10mV for each 1°C. If this sensor senses the temperature which is greater than it's reference temperature (25°C),later it will send the signal to microcontroller. So, the sensitivity of the sensor is important here.

(ii) Microcontroller

This controller system will control the input system and outputs system with the instruction have been programmed. Each of the input signal receive by input module will be read and transfer the ouput signal to the output module perform the speed of the fan according to the temperature value.It will make the system run automatically.

(iii) DC Brushless Fan

After the microcontroller is received the signal, it will send back the action signal to DC Brushless Fan to increase the fan's speed. If the room. temperature is less than reference temperature, the fan's speed will be reduced.

(iv) Strobe Light

This light will operate when sensor detect the highest temperature.

(v) Liquid Crystal Display (LCD)

This output system is completed with LCD display which can display the room temperature various with the speed of the DC Brushless fan.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter reviews about previous system that been developed and has similarities with the automatic control room temperature plus the components that will be used in developing this system.

2.2 Intelligent Fan Coil Controller (TLR-D5).

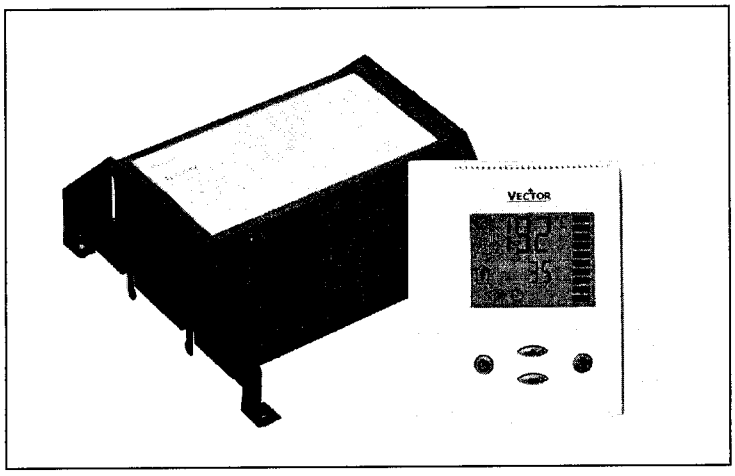

Figure 2.1 Intelligent Fan Coil Controller (TLR-D5).

The Intelligent Fan Coil Controller (TLR-D5) is a stand alone electronic single loop controller with a fan control option by using a binary sequence (On/Off) concept. The controller has one NTC room temperature sensor and five relays as the outputs controller. Relay is the main part to control the speed of the fans which is low, medium and high speed manually. By manually, remote controller provided need to be set up by setting several parameter during operation. TLR-D5 also not need a special tools or software to run, it need only several relay to change the AC to DC. TLR-D5 generally use in the air systems, consists three stage fans for single duct systems and for water systems. TLR-D5 model is available in 24V and 240V in operating voltage.

2.3 Series Electronic Fan Speed Controls (P66).

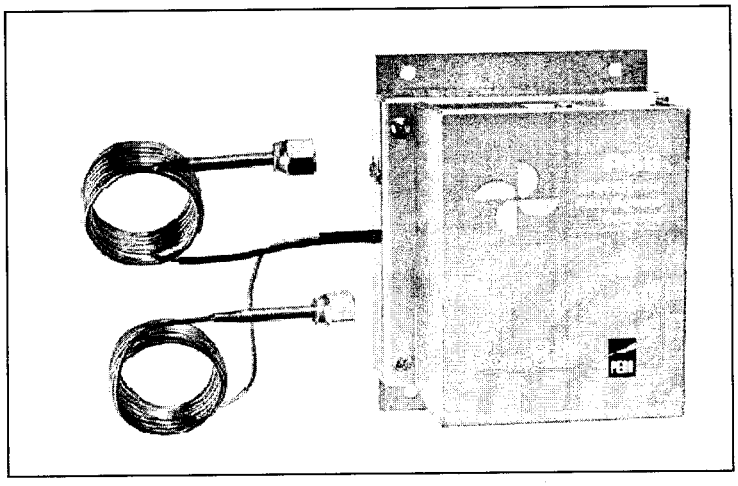

Figure 2.2: Series Electronic Fan Speed Controls (P66).

The Series Electronic Fan Speed Controls (P66) is the refrigerant pressure actuated and electronic motor speed controllers. The P66 controller are designed for use with single phase permanent split capacitor motors that are approved by the motor manufacturer for speed control applications. The P66 controls provide

condenser pressure control by directly sensing condenser refrigerant pressure and automatically adjusting the condenser fan motor speed according to the sensed pressure. The P66 provides an alternative to fan cycling control in variable size refrigeration and Heating, Ventilating, and Air Conditioning (HVAC) applications.

2.4 Automatic Ceiling Fan Controller

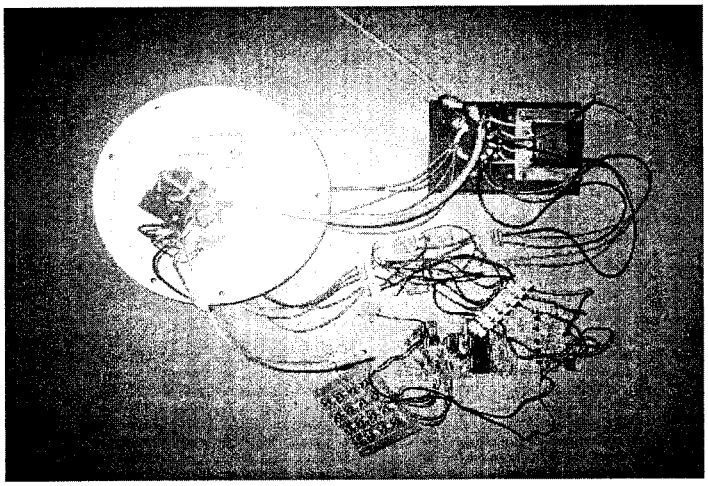

Figure 2.3: Automatic Ceiling Fan Controller

Automatic ceiling fan controller based on temperature is using the PIC16F877A microcontroller chip. The way of automatic controller working is like so, when a user key in the interested room temperature, the PIC16F877A will analyze and get the actual room temperature. After that, it will compare with the interested temperature and actual temperature. If the ΔT is $1<T<2$, it switches speed 1. If the ΔT is $3<T<4$, it switches speed 2. If the ΔT is $5<T<6$, it switches speed 3. If the ΔT is $7<T<8$, it switches speed 4. If the ΔT is $9<T<10$, it switches speed 5. The ceiling fan controller automatically will change the speed according to the room temperature after first manually set up by user. The users only require to set the key in the interested temperature, and then the ceiling fan controller will be working for

the users. From this, the ceiling fan controller can be working effectively and it can save the usage of electricity.

2.5 Series Thermocouple Switch (TCS)

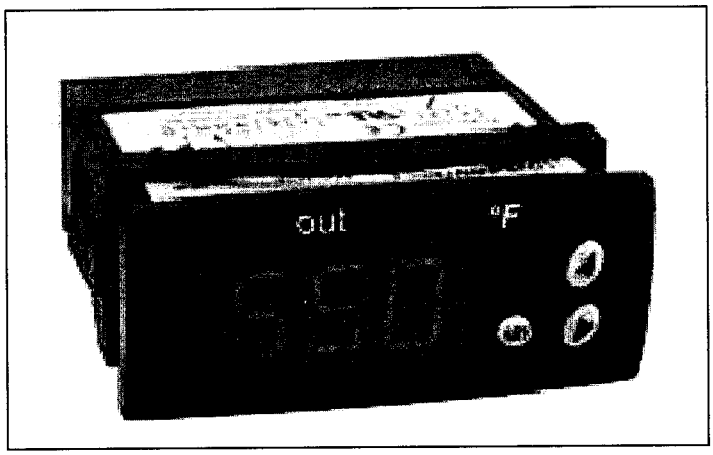

Figure 2.4: Series Thermocouple Switch (TCS)

Series Thermocouple Switch (TCS) is used to monitor and control temperature in heating and cooling applications. TCS offers a J, K or S thermocouple. sensors as the input with two selectable alarm sets and an internal buzzer indicating alarm condition. The user can define set point, heating and cooling regulation, cycle time, alarm configuration, load status, and ambient probe adjustment. The thermocouple switch has features password protection and error messaging. Temperature and output status is indicated on the bright red LED display. The Series TCS includes a fitting clip for panel mounting, gasket and rear terminal cover.

2.6 Microcontroller

Microcontroller is an essential electronic device that change the electronics design topology since its inception few decades ago. Basically, microcontroller is a computer system that is fabricated in a single integrated chip. It is used as a device that can form the basic of an embedded system for electronic applications. Microcontroller is divided into several categories i.e. 8-bit, 16-bit, 32-bit etc. [5]

Microcontrollers are general purpose of microprocessor which has additional parts that allow it to control external devices. Basically, microcontrollers execute a user program which is loaded in its program memory. Under the control of this program data it received from external devices input, manipulated and then sent to external output devices. The architecture of microcontroller consists of a micro processor, memory, and input/output. Memory is an important part where it divides into two groups: program memory and data memory. Program memory stores the entire program coded and this memory is usually non-volatile example data is not lost when power is off. Data memory is where the temporary user data is stored during the various arithmetic and logical operation.

2.6.1 Memory

There are five basic types of memory to execute a user program microcontroller

(i) RAM

RAM means Random Access Memory. It is a general purpose memory which usually stores user data. RAM is volatile example data is lost after the power is removed. Most of microcontroller has some amount of internal RAM. 256 bytes is a common amount, although some microcontroller has more or less.