DEVELOPMENT OF DRYER SYSTEM FOR LAUNDRY BUSINESS

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ABSTRACT

Today, some laundry businesses still use traditional mechanism to dry laundries after wash. This method is done by hanging up them on the wire, especialy for comforter under the sunshine eventhough they had been spinned dry by using machine. Problems will happen when it is raining, they need to pick up to prevent them from wet again and several workers are needed. To solve this problem, a dryer system is developed by constructing the dryer room which can be used in sunshine day and rainy day. On the sunshine day, the drying process purely using sunshine through autoamtic roof opening of the room. While on rainy day, the drying process is done by blowing up hot air to the wet laundries. This system is controlled using microcontroller and two sensors are used. They are rain sensor to detect rain and send massege to the controller to open or close the roof and humidity sensor to detect the room humidity. The humidity is corelated with dry conditon of laundries. When, the humidity is high it means the laundres still wet and the controller should switch on the heater and fan. The simulation results using the prototype of dryer system show that the objective of the research has been justified. The developed dryer system in some way has helped the traditional laundry businesses to improve their businees productivity and save operational cost.

Keyword: traditional laundry business, automatic roof, microcontroller, rainy.

Introduction

Today, most of people are busy; therefore they send the dirty laundries to the laundry business. The dirty laundry will be washed and spin for preliminary dry by washing machine. This drying method still needs further dryer process, especially for comforter. In some traditional laundry business, the laundries are exposed to natural sunshine for drying [1,2]. This mechanism is not suitable for commercialize sector. The clothing may expose to environmental contaminants such as soil, dust, smoke, pollen and animal droppings that can come in contact with the clothing [3].

Most dryers consist of a rotating drum called a tumbler through which heated air is circulated to evaporate the moisture from the load. The weaknesses of this machine are expensive to buy and repair besides hard to maintain [4].

Therefore, an economic and clean system for the drying process is developed. The system is controlled using PIC 16F877A microcontroller. Three kinds of sensor are used as input variable for controller. They are relative humidity sensor, temperature sensor and rain detector sensor. Temperature sensor has function to sense the temperature of drying room, send the signal to controller to switch on or off the heating element. Relative humidity sensor has function to monitor the laundries dry level and send signal to controller as input for on or off the blower. Next, the rain detector and light sensor send signal to controller as input to open or close roof.

Objective

The objective of the paper is to develop the economic and clean drying system to improve the productivity of a traditional laundry business.

Dryer Room Development

The block diagram dryer room system is shown by Figure 1. The system consists of three main circuits which are the rain detector circuit, the temperature circuit and the humidity circuit. All the circuits are controlled by a microcontroller which is the mind of this system.

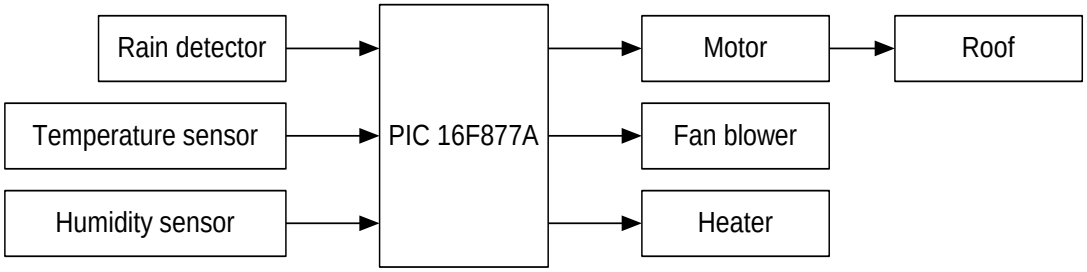

Figure 1: Room dryer system

Proteus 7 and MPLab IDE are two software involved in this work. Proteus is a low-cost EDA package offering facilities for schematic drawing, SPICE simulation and PCB layout while MPLab IDE is used to create source code using the built-in editor in that software.

DC Motor

DC motor is commonly used as a driver [5]. It is used for opening and closing the room roof. The power of the dc motor used is determined based on the weight of the roof.

Microcontroller

In this developed system, PIC16F877A has function to be the main controller. PIC is a single chip which means that the entire computer system lies within the confines of the integrated circuit [6]. Microcontrollers must contain at least two primary components random access memory (RAM), and an instruction set. RAM is a type of internal logic unit that stores information temporarily. RAM contents disappear when the power is turned off. While RAM is used to hold any kind of data, some RAM is specialized, referred to as registers. The instruction set is a list of all commands and their corresponding functions. During operation, the microcontroller will step through a program. Each valid instruction set and the matching internal hardware differentiate one microcontroller from another.

Temperature Sensor

The room temperature is measured using LM35 temperature sensor. The output of temperature sensor is sent to the PIC as an analog signal. It should be able to withstand the harsh environmental condition such as freezing condition and must be water resistant [7].
Temperature sensor circuit is shown by Figure 2. The sensed temperature is displayed on a LCD screen.

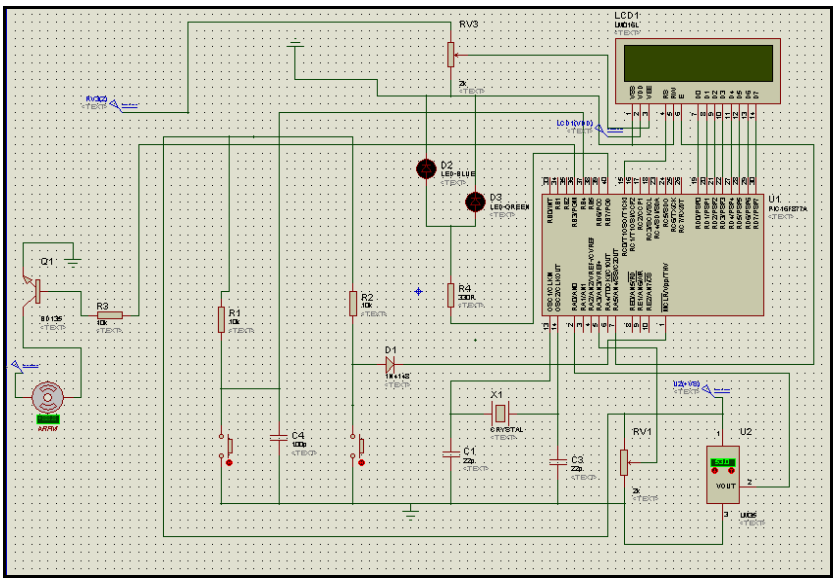

Figure 2: Temperature circuit

Humidity Sensor

The SN-HMD humidity sensor needs to measure the ambient humidity [8] and will send the humidity reading to the PIC as an analog signal. This sensor should be water resist. Figure 3 represents the circuit diagram of humidity sensor.

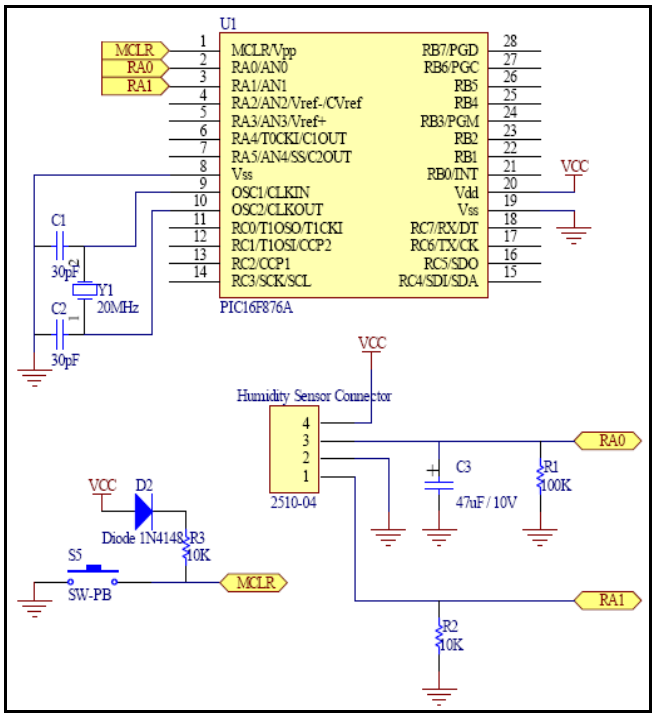

Figure 3: Humidity sensor circuit

Rain Detector

Rain detector has function to detect the rain drops and send the information to PIC. Based on data, PIC will open or close the roof. Figure 4 shows the rain detector circuit.

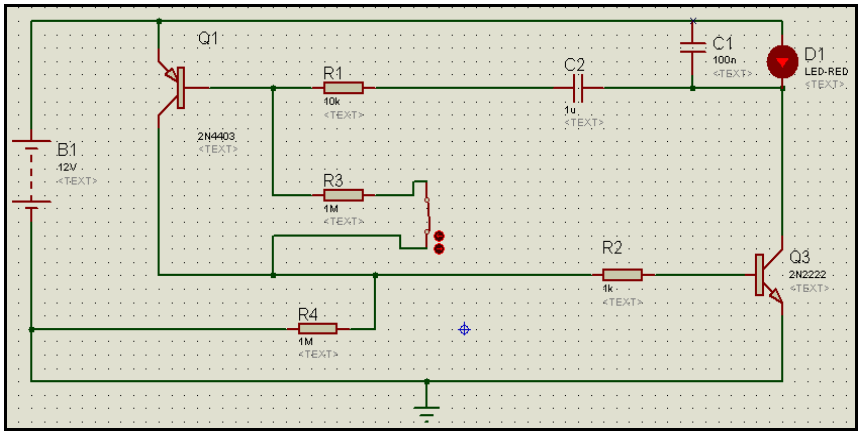

Figure 4: Rain detector circuit

Liquid Cristal Display (LCD)

A liquid crystal display or LCD is a thin, lightweight display device with no moving parts. It consists of an electrically-controlled light-polarizing liquid trapped in cell between two transparent polarizing sheets. The polarizing axes of the two sheets are aligned perpendicular to each other. Each cell is supplied with electrical contacts that allow an electric field to be applied to the liquid inside. When an electric field is applied, the molecules in the liquid align themselves with the field, inhibiting rotation of the polarized

light. As the light hits the polarizing sheet perpendicular to the direction of polarization, all the light is absorbed and the cell appears dark [9].

Result and Analysis

To fulfill the objectives, some tests have been done which result as the following.
Temperature circuit test result represented by Figure 5.

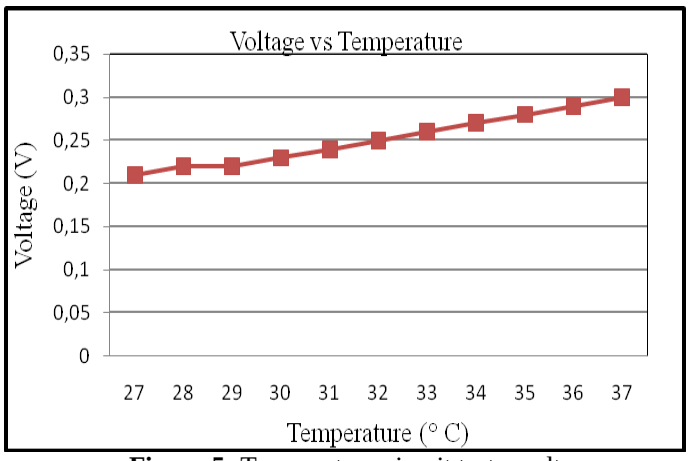

Figure 5: Temperature circuit test result

In the Figure 5, the output response graph shows that the voltage and the temperature are linear with each other. So the temperature circuit is functioning as desired by the system

Humidity sensor circuit test results are shown as in Figure 6.

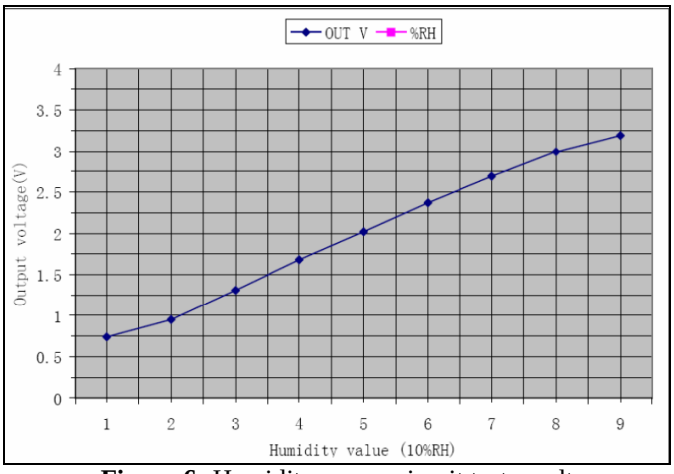

Figure 6: Humidity sensor circuit test result

From the graph response that had been plotted as in Figure 6, the results show that output voltage is linear with the percentage of RH. It means the circuit has fulfilled the requirement.

Comparison

To know the advantages of this development, comparison between the blanket dry under the sunshine and in a drying room was done. Figure 7 and Figure 8 shows the sample of laundries dry under the sunshine and in a drying respectively. While Table 1 and Table 2 represents the comparisons between different types of laundries drying process that were used.

Figure 7: Laundries that dry under sunshine

Figure 8: Laundries that dry in a drying room

The result indicated that the laundries dried under sunlight takes 2 hours to dry compared in a drying room which takes one and half hour. The details are listed in Table 1.

Table 1: Laundries that drying under sunshine

Types of blanket	Condition	
	Wet	After being dried by spin
Cotton	7 hours	4 hours
Fiber cotton	5 hours	3 hours

Table 2: Laundries that drying in a drying room

Types of blanket	Condition	
	Wet	After being dried by spin
Cotton	6 hours	1 hours
Fiber cotton	3 hours	45 minutes

Data represented in Table 1 and Table 2 show the differences between two types of laundries that have been dried in two ways; under sunshine and in a room. Test was done for two types and two conditions of laundries. There are cotton blanket and fiber cotton. The conditions are wet and preliminary dry by spin machine. The time taken for drying under sunshine is shown by Table 1, while using a dryer room is represented by Table 2.

The time taken for drying the laundries is shorter using a dryer room as compared to under the sunshine. It means a dryer room can save time and increase number of laundries that can be dried especially in rainy season. The developed dryer room can also be used under sunshine during hot weather for energy saving.

Conclusion

A developed dryer room has ability to dry the wet laundries faster than using sunshine especially in rainy season. For energy saving, during hot weather, the drying process is done under sunshine by automatic opening of room roof. The mechanism can also save number of worker and increase the productivity of laundry business.

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