Wireless Fire Alarm System in Power Plant

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***Abstract* - This paper presents a wireless fire alarm system in power plant. In the wireless fire alarm system had two sensors like smoke sensor and temperature sensor. The smoke sensor is detected the smoke when during the fire disaster happens. The fire disaster happens the temperature will increase to above 65^{0}C all the wire will burnt and will getting smoke around the room. When the smoke sensor and the temperature sensor had signal will pass through to microcontroller PIC18F4550 and send the data to computer with using X-bee Pro device. The X-bee Pro will receive signal to computer and show in the Visual Basic about the status of the room and the temperature at the room.**

Keywords– Smoke sensor, Pinguino, Visual Basic, X-bee Pro

I. INTRODUCTION

Nowadays power plant is the important building for every country to supply the electrical to the village. In 2008 to 2012 had three power plants in the world had happen the fire disaster that is Tilbury power plant in United Kingdom, PSE&G power plants in South Kearny in USA and the Rajghat power plant in India. From the Zhang Kun [1], Foster [2] and Chai Chunlai [3] had done the fire alarm system applied in difference building, example house, office, power plant and shopping center. The wireless fire alarm system is difference for between office and power plant. The fire alarm system is to apply in the building where have many people around there or the building is important. In final year project, design about the fire alarm system in power plants will be developed. The final year project is to design a fully automatic fire alarm system. In addition, the fire alarm system is used wireless to communication and the high level C language to program the microcontroller. When the fire disaster happens the wire is the fastest burnt and it will make the system down. The wireless fire alarm system should be more safety than the normal wire alarm system. In power plants easy happens fire disaster when over heat and will burning machine or wire while that will have smoke. In final year project, the program for the microcontroller will use the high level of C language in Pinguino for the microcontroller. When the fire disaster happens, the smoke sensor and temperature sensor are detected. When the smoke sensor detects the smoke and the temperature sensor detected the wireless fire alarm system will send the signal to the main board.

TABLE 1: STUDY CASE COMPARISON

Previous Work	Design	Fire Alarm	Wireless	Result
Lee Kah Weng [4]	PIC16F877A with MikroC	Buzzer and computer	315Mhz Transmitter and Receiver	GUI program
Mohammad Hasnan [5]	PIC16F877A with Mplab	Buzzer	none	Sprinkler motor
Nur Hakimah [6]	PIC16F873 with Mplab	Buzzer and mobile phone	315Mhz Transmitter and Receiver	Send message to mobile phone

II. METHODOLOGY

In this project, wireless fire alarm system shows the block diagram in Figure 1. The wireless fire alarm system program will follow Figure 2. The Figure 2 shows the flow chart for main program in the microcontroller. This flow chart can ensure the coding correct and can info the person who using the wireless fire alarm system with correct method.

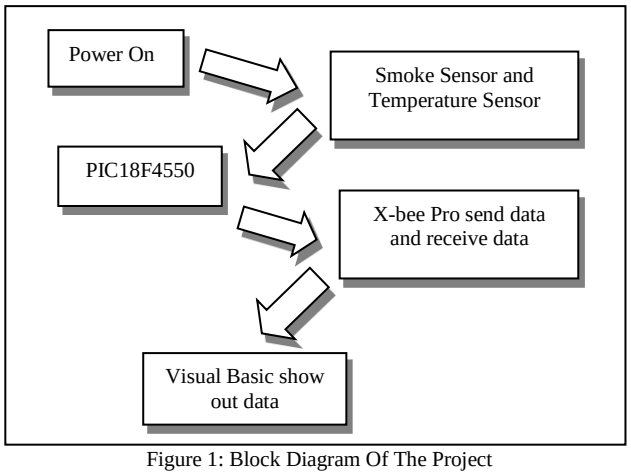

Figure 1: Block Diagram Of The Project

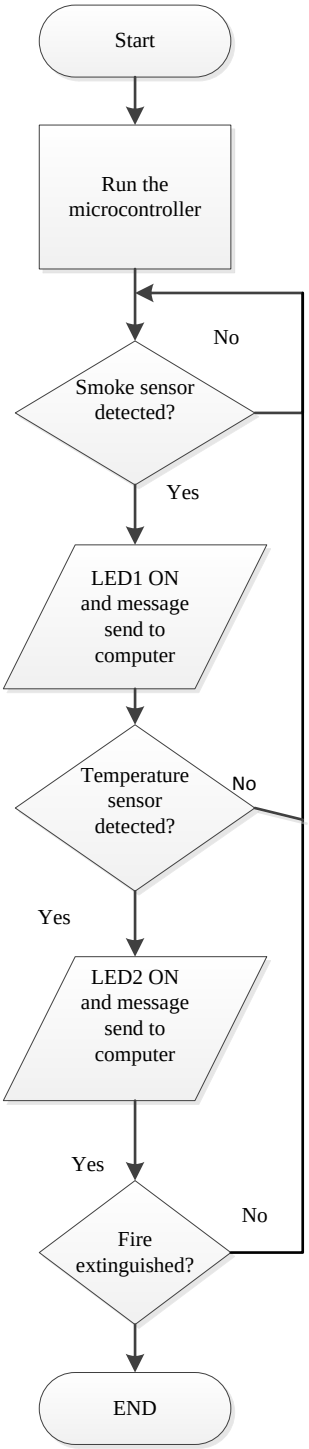

Figure 2: Flow Chart for Software Development

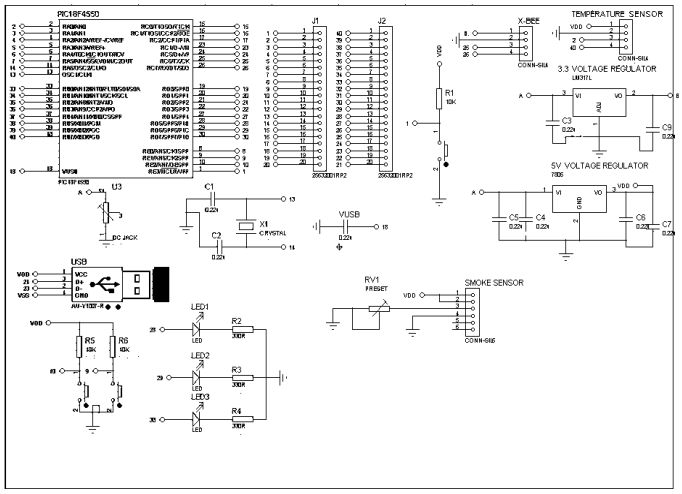

Figure 3: Wireless Fire Alarm System

Figure 3 shows the wireless fire alarm system of the Protues which is the microcontroller circuit.

Figure 4: X-bee Pro

Figure 5: Temperature Sensor

Figure 6: Smoke Sensor

Figure 4 shows the X-bee Pro wireless device. This device is used for the wireless communication for sending data to computer from microcontroller. Figure 5 shows the temperature sensor which using to detect the heat from burning or fire disaster. Figure 6 shows the smoke sensor which is detected the carbon monoxide when fire disaster happens.

III. RESULT AND ANALYSIS

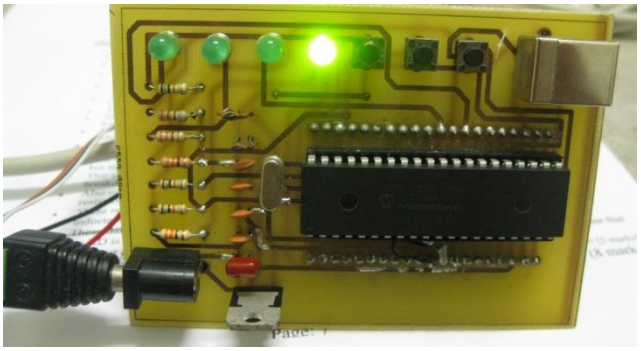

Figure 7: The Wireless Fire Alarm System ON When Have Electrical Supply

Figure 8: The LED For The Signal ON

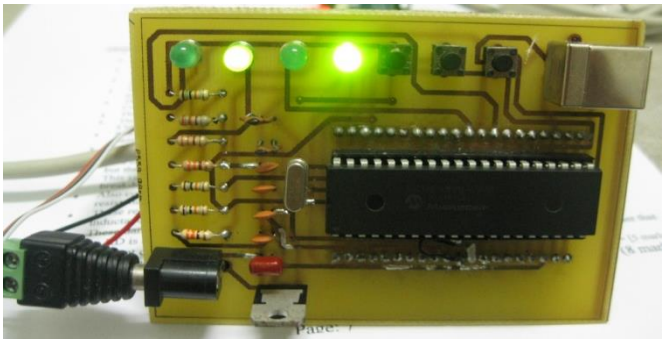

Figure 9: The LED ON When The Condition Room Is SAFETY

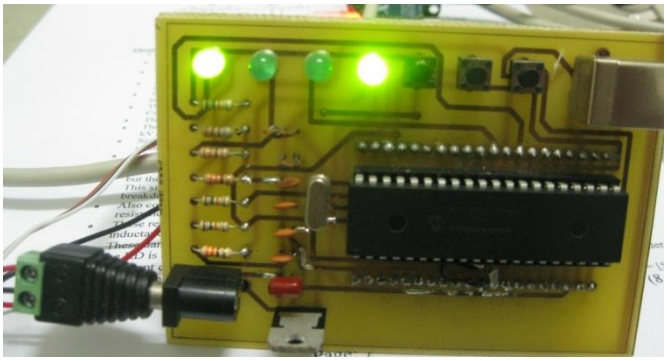

Figure 10: The First LED ON When The Condition Room is DANGER

Figure 7 shows when the power supply is plug in to the wireless fire alarm system the LED at right will always ON. Figure 8 shows that the signal for second last LED ON will make sure the system is running without any problem about the coding. Figure 9 shows that the second LED from left ON is showed the condition of the room is under 65^0C in temperature, so is safety. The Figure 10 shows the first LED from left is showed the condition is dangerous when the temperature higher than 65^0C.

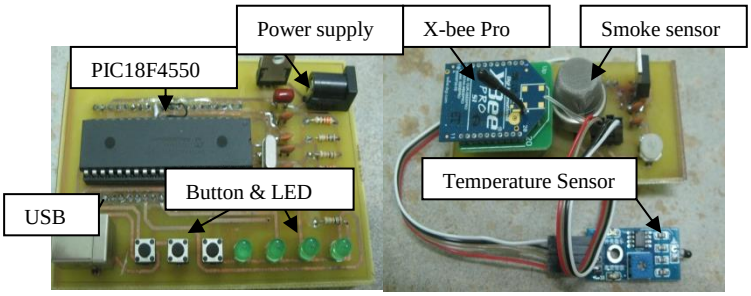

Figure 11: The Component on PCB in Wireless Fire Alarm System

Figure 11 shows the component on the wireless fire alarm system. The left PCB shows the microcontroller, power supply, USB, LED and button. The left PCB shows the temperature sensor, smoke sensor and X-bee Pro. The right PCB will be the main circuit because it is microcontroller and the result will show at there. The left PCB shows the sensor board which include the wireless device.

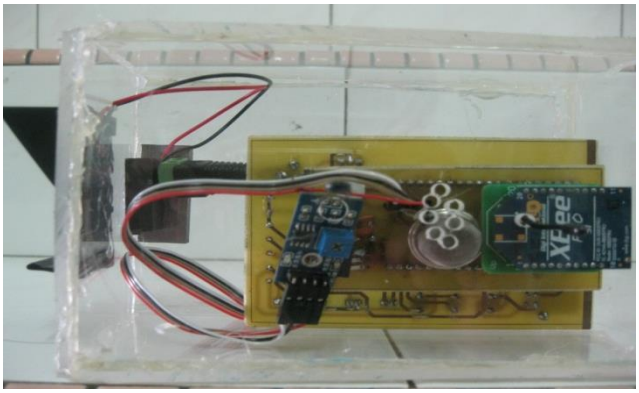

Figure 12: The Wireless Fire Alarm System

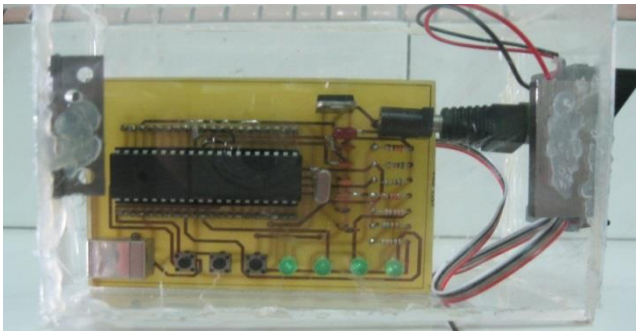

Figure 13 The Wireless Fire Alarm System Microcontroller

Figure 12 shows the front of the boxes which install the wireless fire alarm system. Figure 13 show the microcontroller and the battery in place on the boxes. In the boxes shows the clear look for the device because can make sure the dust will not in the boxes. The boxes can open and close at the back of the boxes. The lock for the boxes is using the magnet is to close the door of the boxes. This boxes can use clean to see the device is function or not.

Figure 14: The Visual Basic Function

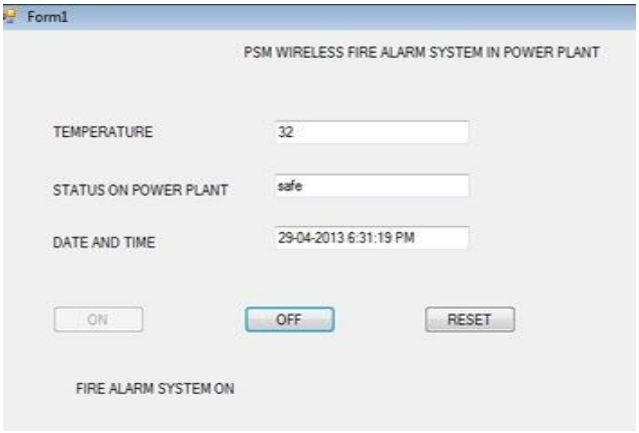

Figure 15: Normal Room Temperature and Status Is Safe

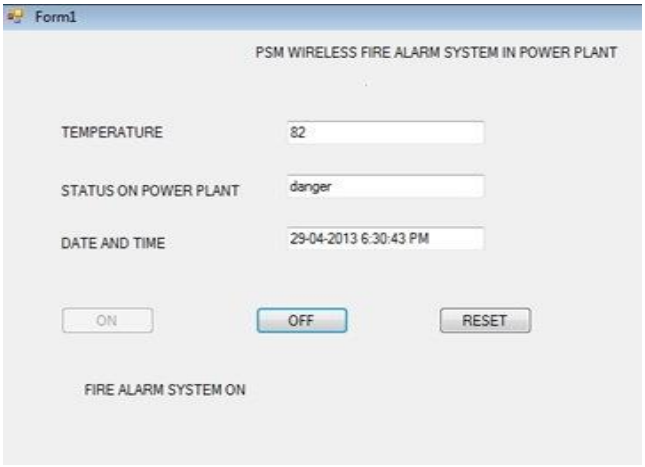

Figure 16: When Have Heat Temperature and Status Is Danger

Figure 14 shows that the normal open the visual basic will have time and date to run and the bottom have the status of the wireless fire alarm system status. Figure 15 shows that the temperature 32^0C as room temperature so that the room is safe. Figure 16 shows that the danger status in room when the temperature over 65^0C.

Analysis

Figure 17 showed the virtual port driver. The virtual port driver for the Proteus communication with Visual Basic. The software is use for the simulation in between the program Proteus and the Visual Basic. This program set the virtual port for the communication serial ports for which pair. This can run the software without connect the product and the Visual Basic.

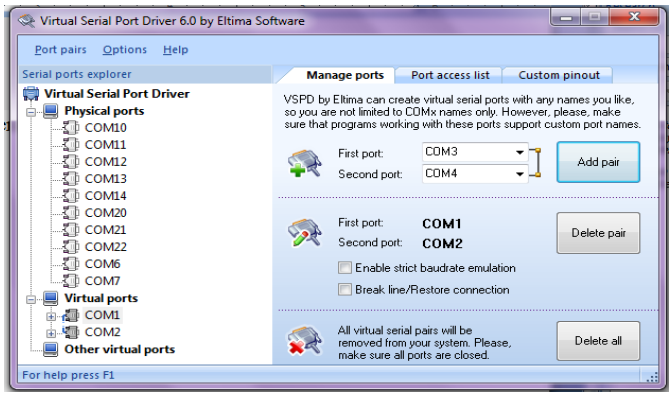

Figure 17: Virtual Port Driver

In this result only test the Visual Basic program which already can use in project. In the project the Pinguino cannot use for the simulation because it opens hardware software. So that will choose the Mikro-C as my second program to do my simulation. For the simulation only test the program and can function then only convert the coding to the Pinguino code.

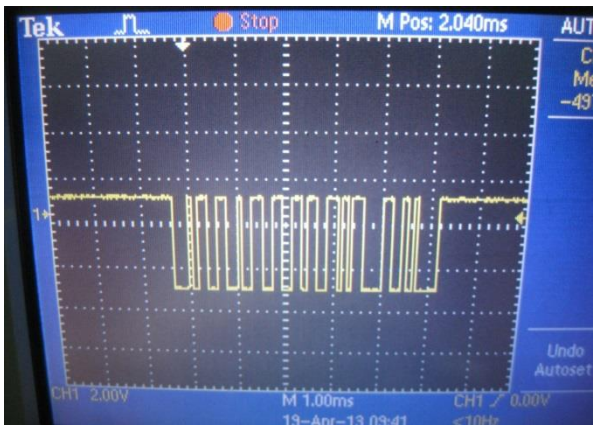

Figure 18: The Signal sent from X-bee Pro Device When SAFETY Condition

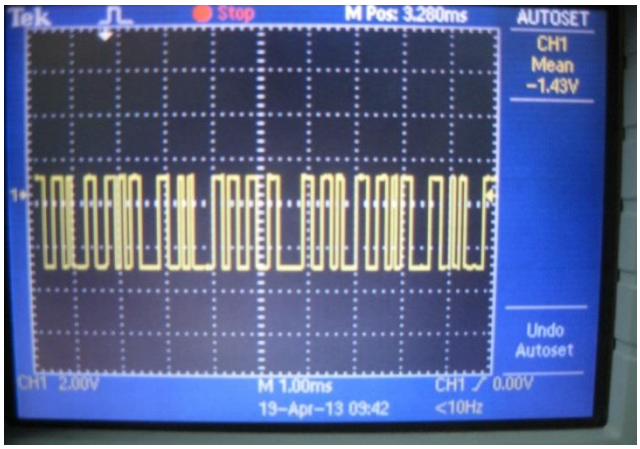

Figure 19: The Signal sent from X-bee Pro Device.When DANGER Condition

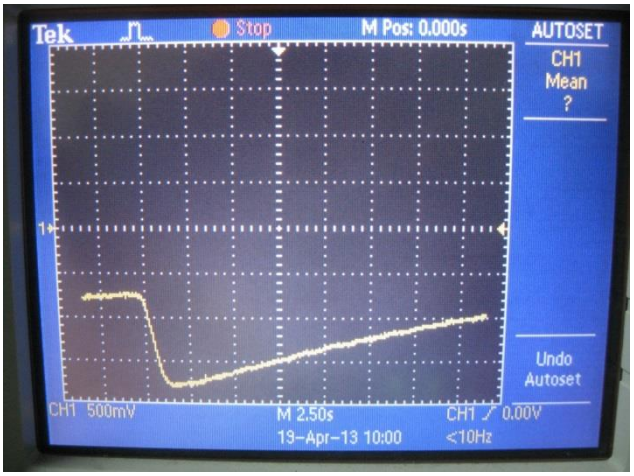

Figure 20: The Analog Signal From The Temperature sensor.

Figure 18 shows the signal send from the X-bee Pro device is using the digital signal show that . Figure 19 shows that the signal send from the X-bee Pro device is using the digital signal. The figure 20 the analog of the temperature sensor will slowly increase to the normal. Temperature sensor detected heat will decreace very fast until the minimun value then the will slowly increase back to normal. This sensor suitable for the fire alarm system.

IV. Conclusion

In conclusion, the system can provide a lots of useful fire information beside of notify and indicate the zone is on fire. The whole system will be controlled by using the program developed. This project already had done by follow the objective to design a wireless fire alarm system with full automatic with using smoke sensor and temperature sensor with microcontroller and the C Language which in Figure 7 – Figure 11. Second objective is to construct the wireless fire alarm system in power plant use the wireless device communicates with computer is done by showed Figure 12 and Figure 13. The third objective to test the wireless fire alarm system in small and safety with boxes and make PCB protection from burning is done by showed Figure 19 and Figure 20.

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