# Maintenance Room Temperature Monitoring System and Notification via Line Application for Communications and Electronics Section, Technical Division, Cast Study: An Agency in Lop Buri Province

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## Abstract

This research presents the maintenance room temperature monitoring system and notification technology for Communications and Electronics Section, Technical Division, Cast Study: an agency in Lop Buri province via Line application. The objective is to study the operation of temperature and humidity monitoring device which is an important device to measure temperature and humidity in the communication network system's maintenance room. So, the officers can work and solve problems more quickly when the equipment in communication network system is damaged from the heat exposure. This research introduces the temperature and humidity monitoring sensor, working together with Arduino board and the operating control programming. The system operation has three cases: 1) The system will send a notification of the maintenance room's temperature every hour via Line application. 2) If the temperature in the maintenance room is higher than the standard temperature, the system will send a notification to an officer via Line application every minute. 3) The officer can always check the temperature of the maintenance room real time automatically. Regarding the test results on system operation test, the system can measure the temperature and humidity inside the maintenance room. It also send a notification of every case to the monitoring officer via Line application. The accuracy of the system is 94%.

KEYWORDS: Temperature Monitoring, Maintenance Room, Notification, Line Application

## 1 INTRODUCTION

Communications and Electronics Section, Technical Division, at an agency in Lop Buri province is responsible for and maintain the conditions of air navigation aids, telephone exchange system, and internet network. These devices are electronic equipment, working 24 hours a day to support the Air Force. The equipment cannot handle high temperature. Plus, the devices are expensive and cannot be replaced within a short period of time. So, the problems with using air navigation aids, telephone exchange system, and internet network occur.

Therefore, the solution is to install the air conditioners in each area. However, there are many far-apart installing points in both telephone exchange system room and internet network room in Communications and Electronics Section, the monitoring officers and related personnel cannot monitor them all over. Thus, sometimes the problems arise. The air conditioner in a room breaks down and its temperature rises too high, damaging the air conditioner itself. The communication is lost for a while which causes serious damage and can lead to aviation accident.

From the mentioned problem, the researcher found the solution with the idea of creating a notification system and a room temperature monitoring system via Line application. This system will alert the officer via Line application. So, the morning officer can take measure timely before the damage takes place.

## 2 RESEARCH OBJECTIVES

To study the operation of the temperature and humidity monitoring device with Arduino board and to study the programming code to control the operation. And to develop the maintenance room temperature monitoring system and notification via Line application for Communications and Electronics Section, Technical Division, at an agency in Lop Buri province.

## 3 RESEARCH METHODOLOGY

### 3.1 System components

This research using Arduino ESP8266 board for communicating on the Wi-Fi standard works at a voltage of 3.0-3.6V with an average current of 80mA. The temperature sensor module using DHT11 temperature sensor connecting with the module has four pins. The first pin is connected to the power supply voltage of 5 volts through the resistor, which maintains the constant voltage. The second pin is connected to the second pin on Arduino Board, the fourth pin is connected to the ground, and the third is not connected. The humidity sensor is a low-cost, easy-to-use, and compatible Arduino module or sensor. It is the type that comes as a module and only has a sensor. By transmitting data from the DHT11, it uses the same cable and is a digital signal. With a measurement error of no more than $\pm 2°C$ Measuring frequency 1 Hz. The overall of our proposed shown in Figure.1

This research is divided into two parts: 1) Main structure of system designing. 2) Working algorithm of the System with details as followings.

### 3.2 Testing the system operation

3.1.1 The system main structure comprises of Arduino board which is the main data-processing device. This Arduino board is connected to other equipment such as temperature and humidity sensors, power supplies, and Wi-Fi devices.

3.1.2 Working algorithm of the system comprises of four steps as following.
Step 1 Start the program
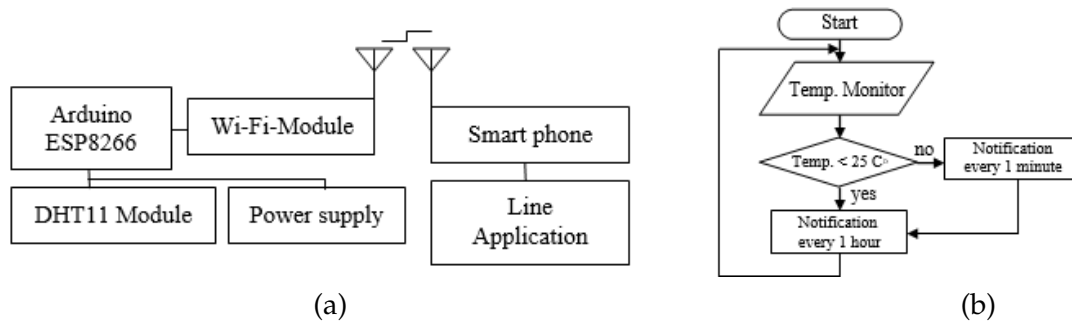Step 2 Activate the temperature and humidity monitoring algorithm

(a)                                                                 (b)

**Figure 1:** *The overall of our proposed (a) The System components connection (b) The algorithm of temperature monitoring and notification system*

Step 3 Check the temperature according to underlying conditions. If the temperature is equal or lower than 25 degrees Celsius, the system will send the notification every hour via Line application. If the temperature is higher than 25 degrees Celsius, the system will send the notification every minute via Line application. Step 4 Return to Step 2.

## 3.3 Testing the system operation

Testing the system operation comprises of two parts as followings.

3.2.1 Test the connection of temperature measuring device and Arduino board. The temperature measuring device to connect with Arduino board has four legs. Leg 1 is connected to 5V power supply via a resistor which will keep the electrical pressure stable. Leg 2 is connected to the data section 2 on the Arduino board. Leg 4 is connected to the ground. Leg 3 has no connection.

3.2.2 Testing the working algorithm of the system. The researcher installed the devices in the maintenance room of Communications and Electronics Section, Technical Division, Air Force Base 2 Lop Buri Province. Inside in the room, there are communication network devices which require air conditioners to extend the communication device service life.

The test is divided into three cases as followings: 1. The system will send a maintenance room temperature via Line application every hour if the temperature is equal or less than 25 degrees Celsius. 2. If the temperature rises higher than the standard temperature, the system will send a notification via Line application every minute.

## ACKNOWLEDGEMENTS
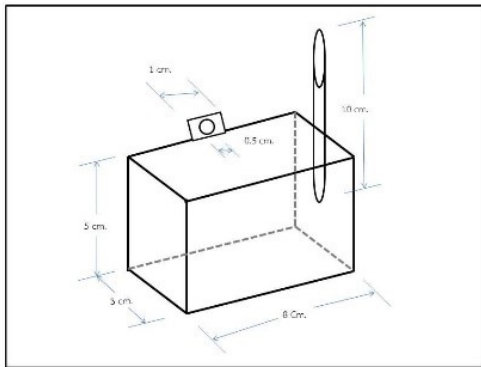
(a)                    (b)

**Figure 2:** *The model of temperature monitoring and notification system, (a) The model structure (b) The external structure*

## 4 RESULTS

### 4.1 The model of the maintenance room temperature monitoring and notification system

### 4.2 The result of sending a temperature notification via Line application every hour and every minute (when the temperature is equal to or less than 25 degrees Celsius.)
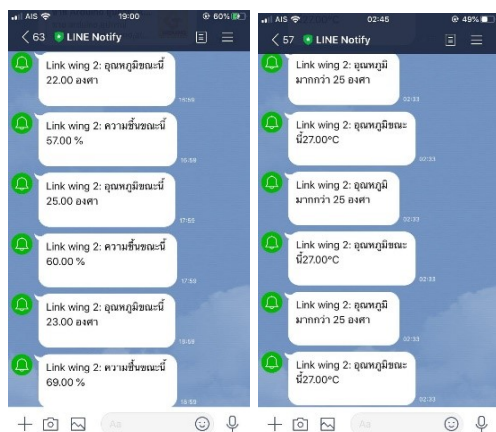


(a)                    (b)                    (c)

**Figure 3:** *Messages received from the system, (a) The notification via Line application every hour (b) The notification via Line application every minute (c) Implementation of system in maintenance room*

# 5 DISCUSSION AND CONCLUSION

This research on the maintenance room temperature monitoring system and notification via Line application for Communications and Electronics Section, Technical Division, at an agency in Lop Buri province is essential for the maintenance room's officers. The device works well accordingly to the researchers' design. The system sends a notification of maintenance room temperature every hour and when the temperature is higher than the standard, it notifies every minute by sending data to the monitoring officer. So, the officer can handle the issue timely before the damage occurs.

The temperature and humidity sensor, which measuring temperature and humidity values, is used together with Arduino board. It uses 4.7-kilohms resistor with the Pull up resistor connecting method to keep the electrical pressure stable. And C programming language in Arduino board to command the device to measure the temperature.

The test finds that maintenance room temperature monitoring system and notification via Line application has high stability. It can detect difference in temperature accurately with minimized errors. Regarding the design, the temperature monitoring device is fixed on the outside of the equipment, allowing the sensor to measure the exact temperature in the maintenance room. The cost of producing the maintenance room temperature monitoring system and notification via Line application is 1,600 Baht. This cost is considered not to be too expensive when comparing to the system efficiency. It is very worth the cost. When the maintenance room has the temperature monitoring system and notification via Line application to monitor at all times, it will maintain the consistent temperature in the maintenance room. It will reduce the risk of damaged equipment from high temperature and the officer can handle the issues in the maintenance room in time before any damage occurs. The method counts the number of times that the temperature meets the specified conditions. When tested 50 times, it was found that the data could be sent via Line application a total of 47 times, representing an accuracy percentage of 94%.

According to the test results, the system has very high stability and can detect different temperature levels. The system is still able to work with only a few errors. The price of the system is 1,600 baht, which the cost of the system is not very high compared to the performance received from the system. In addition, there is quite a lot of control. Therefore, it is suitable for use in other tasks that require surveillance, such as the case study of this agency.

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