IOT DATA LOGGER SYSTEM AND AUTOMATION FOR INDUSTRIAL CHILLER

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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DEDICATION

I dedicate my thesis to my parents Zaini bin Tumian and Muna Binti Al Aisri @ Alasri for their endless love, support, and encouragement throughout my pursuit for education. Besides, I would like to dedicate my thesis to my supervisor and co-supervisor, Prof. Dr. Abdul Rani bin Othman and Ir. Dr. Anas bin Abdul Latiff for guiding and motivating me throughout this final project and also my supportive friends.

ABSTRACT

Since the national agro-food policy 2.0 has been widely introduced in the country, the use of IoT technology is strongly encouraged to drive towards a developed country. IoT technology is widely used in the entire world because of the latest technology that has been implemented in our lives. The advantages of IoT are efficient resource utilization, minimizing human effort, saving time, enhancing data collection, and improving security. A poor monitoring process by human effort may affect the quality and safety of the food or products in the chiller. The failures of a chiller in a cold chain become critical when the quality of the product decreased, it will lead to the loss of industrial profit that affects both the chiller and the products. Thus, this project proposes an IoT system that can monitor the temperature, humidity, and compressor status. Furthermore, the sensor's data will be stored and applied to some analysis for future improvement. At the end of this project, this system can notify the user about the status of the chiller, and the user can control the relay to turn on and off the power point.

ABSTRAK

Sejak Dasar Agromakanan Negara (DAN 2.0) telah diperkenalkan secara meluas di negara ini, penggunaan teknologi IoT amat digalakkan untuk memacu ke arah negara yang maju. Teknologi IoT digunakan secara meluas di seluruh dunia kerana teknologi terkini telah dilaksanakan dalam kehidupan kita. Kelebihan teknologi IoT adalah penggunaan sumber yang sangat cekap, meminimumkan usaha manusia, menjimatkan masa, meningkatkan pengumpulan data dan meningkatkan keselamatan. Proses pemantauan yang lemah di mana ia dikendalikan oleh tenaga manusia boleh menjejaskan kualiti dan keselamatan makanan atau produk di dalam penyejuk. Kegagalan penyejuk dalam rantaian sejuk boleh menjadi kritikal apabila kualiti produk tersebut menurun, ia akan membawa kepada kehilangan keuntungan industri di mana ia akan menjejaskan penyejuk mahupun produk tersebut. Oleh itu, projek ini mencadangkan sistem IoT yang mampu memantau suhu, kelembapan, dan status kompresor. Tambahan pula, data penderia akan disimpan dan digunakan dalam beberapa analisis dalam penambahbaikan pada masa hadapan. Pada akhir projek ini, sistem ini boleh memaklumkan kepada pengguna mengenai status penyejuk, dan pengguna boleh mengawal geganti untuk menghidupkan dan mematikan titik kuasa.

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LIST OF SYMBOLS AND ABBREVIATIONS

IoT	:	Internet of Things
UV	:	Ultraviolet
FAMA	:	Federal Agricultural Marketing Authority
Wi-Fi	:	Wireless Fidelity
AC	:	Alternating Current
DC	:	Direct Current
VAC	:	Volts Of Alternating Current
VDC	:	Volts Of Direct Current
IDE	:	Integrated Development Environment
CPU	:	Central Processing Unit
SoC	:	System on Chip
RAM	:	Random Access Memory
EPROM	:	Erasable Programmable Read-Only Memory
OS	:	Operating System
Wh	:	Watt-hour
IC	:	Integrated Circuit
RSSI	:	Received Signal Strength Indicator
dBm	:	Decibel-Milliwatts

°C	:	Degree of Celcius
LTC	:	Low-Temperature Condition
GPIO	:	General Purpose Input Output
I2C	:	Inter-Integrated Circuit
LCD	:	Liquid-Crystal Display
RO	:	Research Objective
MQTT	:	MQ Telemetry Transport
PERG	;	Photonics Engineering Research Group
3D	;	3-Dimensions
PCB	:	Printed Circuit Board
SDA	:	Serial Data
SCL	:	Serial Clock
mA	:	Milli-Ampere
RH	:	Relative Humidity
RMS	:	Root Mean Square
SDG	:	Sustainable Development Goals

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CHAPTER 1

INTRODUCTION

1.1 Project Introduction

Since the national agro-food policy has been widely introduced in the country, the use of IoT technology is strongly encouraged to drive towards a developed country. IoT technology is widely used in the entire world because of the latest technology that has been implemented in our lives. The advantages of IoT are efficient resource utilization, minimizing human effort, saving time, enhancing data collection, and improving security. A poor monitoring process by human effort may affect the quality and safety of the food or products in the chiller. The failures of a chiller in a cold chain become critical when the quality of the product decreased, it will lead to the loss of industrial profit that affects both the chiller and the products. Thus, this project proposes an IoT system that can monitor the temperature, humidity, and compressor status. Furthermore, the sensor's data will be stored and applied to some analysis for future

improvement. At the end of this project, this system can notify the user about the status of the chiller, and the user can control the UV light to protect the products.

1.2 Problem Statement

The Federal Agricultural Marketing Authority (FAMA) was established as a marketing agency under the Ministry of Agriculture and Food Industry. FAMA is responsible for the marketing of agro-food products such as vegetables, fruits, and flowers as well as food industry and agro-based products. One of the facilities that FAMA uses today is a freezer. The purpose of FAMA using the freezer is to store agro-food so that the product is not easily spoiled. In addition, FAMA provides a service to the public to rent the freezer. The temperature, humidity, and condition of the compressor need to be monitored at the site continuously when storing products in the freezer. A study published in Resources, Conservation & Recycling shows that monitoring and controlling temperature along supply chains emerges as a key aspect to deal with food waste, as well as increasing both food safety and the quality offered to consumers [1]. Another detail in ensuring the quality of the food is to monitor the door of the freezer.

Monitoring stations are usually very expensive, consume high power, huge in volume, and are weighty which makes them unable to deploy in a wide area [2]. Therefore, to solve this problem, this project will target to develop and design an IoT system that does not require high expenses to implement in the industry.

1.3 Objectives

1. To study the sensors that are suitable for use in chiller rooms. [RO1]
2. To design and develop the monitoring and controlling system using IoT technology. [RO2]
3. To analyze the signal strength and the DC-to-DC voltage converter. [RO3]

1.4 Scope of Work

1. Develop coding to read and measure the sensors and send data to the cloud [RO1].
2. Design a circuit that able to include microcontroller, voltage regulator, and sensor pin. [RO2]
3. Develop IoT dashboard and data logger in a cloud system [RO2].
4. Hardware: NodeMCU ESP32, SHT31, SCT-013-000, relay, and LCD.
5. Software: Arduino IDE, Proteus, ThingSpeak (MATLAB), Cayenne, and Google Sheets.

CHAPTER 2

BACKGROUND STUDY

2.1 Introduction

To examine and collect additional useful information and data for this project, a review will be undertaken in this chapter. To perform a thorough analysis of various ideas and background studies, various research papers, journals, and internet resources like E-books will be explored. Practically, this chapter will focus on the previous research about system development in IoT technology and study on analysis in the data logger. The main purpose of this background study which to figure out the microcontroller used to develop the system and the type of sensor to measure the data and store it in the cloud.