INVESTIGATION OF COOLING IN THE AIR CONDITIONING ROOM WORKING CONCURRENTLY WITH AIR DISCHARGE AND AIR INLET SYSTEM

By

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I14005633

FINAL PROJECT REPORT

Submitted to
the Faculty of Engineering and Quantity Surveying
in Partial Fulfillment of the Requirements
for the Degree of

BACHELOR OF ENGINEERING (HONS)
in
MECHANICAL ENGINEERING

At

INTI INTERNATIONAL UNIVERSITY
Persiaran Perdana BBN, Putra Nilai, 71800 Nilai
Negeri Sembilan, Malaysia

JANUARY 2018

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APPROVAL

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A project dissertation submitted to the
Faculty of Engineering and Quantity Surveying
INTI INTERNATIONAL UNIVERSITY
in partial fulfilment of the requirement for the
Bachelor of Engineering (Hons) in
Mechanical Engineering

Approved:

Dr. Girma Tadesse Chala
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INTI INTERNATIONAL UNIVERSITY
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April 2018

DECLARATION

I, the undersigned, hereby declare that this report is my own independent work except as specified in the references and acknowledgements. I have not committed plagiarism in the accomplishment of this work, nor have I falsified and/or invented the data in my wok. I am aware of University regulations on Plagiarism. I accept penalties that may be imposed for any violation.

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ABSTRACT

The purpose of the present work was to investigate of cooling in the air conditioning room working concurrently with air discharge and air inlet. The venue is in a kitchen located at Inti Subang Culinary Department, Malaysia. The kitchen air temperature, pressure, air flow and relative humidity was varied depending on different actions were taken. For an example, with or without the stoves operating, how many stoves are operating together, with or without the door closed, how many students are practicing cooking and how many students are using the refrigerator, these are all the condition that will affect the temperature, pressure, air flow and relative humidity inside the kitchen. Moreover, the changing rules of indoor thermal environment have an impact on human thermal comfort. Also, while investigating air conditioning system, air discharge and air inlet, an investigation of how these system affects human health and thermal comfort are included. Besides, the increasing in energy consumption and thermal comfort of an air-conditioned room have attracted attentions from the public. So, it is necessary to determine the effect of this system towards human. An experimental investigation in the kitchen will be carry out during Stage 2, these results from the investigation are used to compare with the simulation result under the same condition. After comparing the result from experiment and simulation and both of them are correct, a forecast of the condition inside the kitchen will be conducted. With proper schematic, grid, mesh and correct boundary condition, we can predict different thermal condition inside the kitchen by using different value of the parameter. Some paperwork of reviewing journal and determining useful parameter and boundary condition are included here. In stage 2, there are total 5 different case studies conducted inside the kitchen which are Kitchen Case 1 – Both Windows and Doors Open (Additional window), Kitchen Case 2 – Doors Close and Windows Open (Additional Windows), Kitchen Case 3 – Both Doors and Windows Close, Kitchen Case 4 – With additional Ventilation System and Kitchen Case 5 – Exhaust with Half Close Valve. With these case studies, I am able to predict the indoor thermal condition by using ANSYS 18.2 simulation software.

ACKNOWLEDGEMENTS

In here, I would like to express my deepest appreciation to all those who provided me the possibility to complete this project. A special gratitude I give to our final year project supervisor, Dr. Girma Tadesse Chala, whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project especially in writing this report.

Furthermore I would also like to acknowledge with much appreciation the crucial role of the staff of FABLAB, Ms Mazlia, who gave the permission to borrow all required equipment and the necessary material to complete my experiment. A special thanks goes to my course mate who took Heat Transfer before, they are willing to teach and guide me when I am doing the experiment in Inti Subang, due to their guidance, I can do the experiment more easily and their opinions are very important to me too. Last but not least, many thanks go to my examiners, Dr. Chuah Keng Hoo and Mr. Lim Jin Wei who willing to spend their time to read my report and listen to my presentation. I have to appreciate the guidance given by other supervisor as well as the panels especially in my project presentation that has improved our presentation skills thanks to their commends and advices.

Nobody has been more important to me in the pursuit of this project than the members of my family. I would like to thank to my parents, whose love and guidance are with me in whatever I pursue. They are ultimate role moles.

DEDICATION

To all those who have supported, encouraged, challenged, and inspired me. And specially to my Beloved Parents, honourable teachers, examiners and friends for all their guidance, love and attention which has made it possible for me to make it up to this point and as well as the Final Year Project Supervisor who bestowed me with the courage, the commitment and the awareness to follow the best possible route, by their unmatchable style and by best possible training.

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CHAPTER 1

INTRODUCTION

1.1 Background

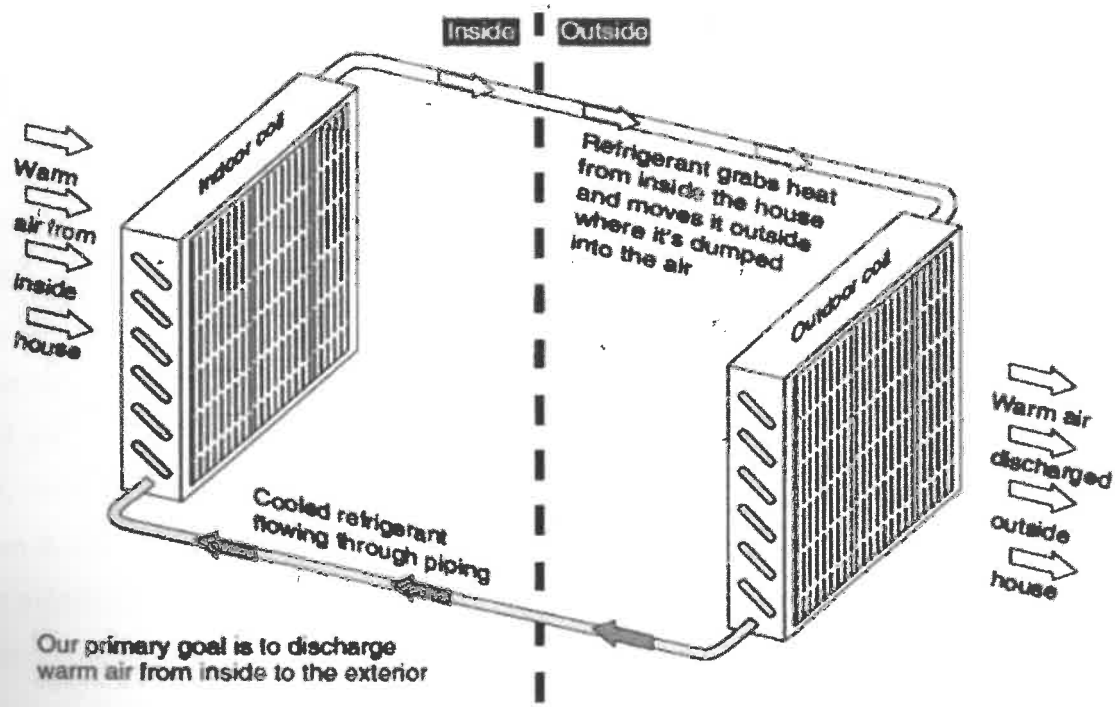

Figure 1: Air-conditioning system

In the world with various type of unpredictable and extreme climate, air conditioning is an unavoidable factor. People nowadays rely on air conditioning system very much. Air conditioning is the process of adding or removing heat from a place, in common word we call it heating or cooling of the specific place average temperature. It also define as the process of altering the properties of air to a more favorable conditions. Air conditioning can be used in many conditions, the main function of air conditioning system is to achieve a more comfortable indoor thermal environment and better indoor air quality in order to satisfy the occupants' comfort. In order to maintain the health and comfort of occupants or to meet the requirement of industrial processes irrespective of the external climatic conditions, these condition must has a well control. Moreover, air conditioning can also use to cool down or dehumidify the electronics devices such as computers and server in office or stove and burner in kitchen. In general, air conditioning can define as the modification of the air such as heating, cooling, humidification, dehumidification, cleaning,

ventilation or air movement. Air conditioners said to be a convenient and valuable equipment to supply air flow for the occupants.

1.2 Problem Statement

In fact, air conditioner has a high impact on energy consumption and energy efficiency, this will influence the emission of carbon dioxide to the environment. Frankly speaking, air conditioning system cause around 50% of office buildings' electric energy consumption. World populations are becoming more dependent on these energy-intensive indoor climates inside buildings. One of the reason is because the peak electricity demand episodes, it is more severe during the summer months in some countries and heat waves. There is an approximation of residential and commercial building sector are consuming about 1/3 of the global final energy, moreover, about 63% of the overall energy consumption in buildings sector covered by Heating, Ventilation & Air conditioning (HVAC) system. So, increasing supply air temperature, lowering supply air velocity while maintaining indoor thermal comfort under different air supply modes is an important point nowadays. In order to prevent energy overused and energy shortage, reducing the emission of greenhouse gas is important too. Various engineering method, statistical method or artificial intelligence method are carried out to implement prediction on the energy consumption.

Moreover, there is an impact of air conditioning system to the sleep quality and health as well. The high velocity of air flow can disturb human sleep effectively which cause thermal discomfort to the occupants. It might cause a problem with the occupants sleep quality for an example like the occupants cannot sleep after awakening or cannot fall asleep. Different healthy person having different sleep quality, Even though for the same healthy person, he or she also having a different sleep quality in two continuously nights. So, the measurement of the sleep quality should avoid the interference. Apart from the side effect on the sleep quality, without proper air conditioning effect also cause a negative impact on human's health. For an example, there are some person don't really like to use air conditioner is because they feel a cold coming on, becoming cold or being lazy after getting up. These are the negative impact if the air conditioning