UNIVERSITI TEKNOLOGI MARA

AIRFLOW STUDY OF AIR-COOLED CHILLERS INSTALLED AT DIFFERENT FLOOR LEVEL

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Dissertation submitted in partial fulfillment
of the requirements for the degree of
Master of Science
In Mechanical Engineering

Faculty of Mechanical Engineering

March 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The arrangement of air-cooled chillers is one of the important factors to efficiently reject heat to the atmosphere. In this work, two units of air-cooled chillers are installed on different floor level. This arrangement affects the ACC units and leads to system failure. CFD simulation is conducted to observe the airflow of the actual arrangement. Two conditions are simulated in this study which are no-wind and with-wind condition. Sensitivity analysis is conducted to obtain the appropriate computational domain for the simulation. The effects of varying the distance between the ACCs is also analysed with six different spacing (3.6 m, 4.0 m, 5.0 m, 6.0 m, 7.0 m and 8.0 m). The effects of installing a barrier between the units is observed with five proposed barrier height (2.04 m, 2.34 m, 2.64 m, 2.94 m and 3.24 m). The airflow for each case is analysed in terms of velocity and temperature distribution, the velocity streamline and the velocity vector. For the actual arrangement of the ACCs, the hot air discharged accumulated at the top and between the units, due to inadequate space for circulation of air. Varying the distance between the ACCs does not improve the circulation of hot air between the units. Increasing the spacing between the units only add up the area needed for installation. The barrier installed separates the hot air discharged from flowing to the unit besides it. Due to the limited space for circulation of air, the hot air accumulates in between the units and the barrier. Each height of barrier gives different circulation of air at the area of interest. From the results, the recommended barrier height to overcome the problems occurred is 2.94 m.

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful Alhamdulillah, all praises to Allah for the strengths and His blessing for me to complete this thesis. Special appreciation goes to my supervisor, Ir. Hazran Husain, for his supervision and constant support. His invaluable help of constructive comments and suggestions throughout the simulations and thesis works have contributed to the success of this research. Not forgotten, my appreciation to my co-supervisor, Dr. Mohd Faizal bin Mohamad for his support and knowledge regarding this topic. My acknowledgement also goes to Mr.Kamarizal Kamaruddin and Mr. Mohd Faizazairi Mohamad Riduan for their co-operations. Sincere thanks to all my friends for their kindness and moral support during my study. My deepest gratitude goes to my beloved parents; Mr. Zamri bin Mohd Sham and Mrs. Ruhanizah binti Ramli and also to my family members for their endless love, prayers and encouragement. To the special one who is always with me through ups and downs, thank you very much for the endless supports and love. To those who indirectly contributed in this research, your kindness means a lot to me. Thank you very much.

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