NUMERICAL SIMULATION FOR THERMAL COMFORT USING CONDITIONED AIR THROUGH MIXING AND PERSONALIZED VENTILATION SYSTEMS IN FIELD ENVIRONMENTAL CHAMBER (FEC)

By

Eng. Hossam Awad El-Maghraby Abdelaal

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE

In
MECHANICAL POWER ENGINEERING

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Under Supervision of

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Key Words: Conditioned Air, Personalized Ventilation, Mixing Ventilation, Thermal Comfort, FEC, CFD

Summary:
Thermal comfort within a Field Environmental Chamber (FEC) office mockup was numerically simulated throughout the current study. The goal of this research was to determine the best scenario to provide conditioned supply of air and distribute it inside an office room by using Mixing Ventilation (MV) and Personalized Ventilation (PV) systems to create the best status of thermal comfort for a sitting occupant who is typing in front of a computer screen. Computational Fluid Dynamics (CFD) method was used and specifically ANSYS FLUENT 14.0 commercial package software to compare the thermal comfort conditions for the occupant with different strategies of air distribution with various flow rates either being used solely or concurrently. Thermal comfort mathematical indices like the Predicted Mean Vote (PMV) and the Predicted Percentage of Dissatisfied (PPD) were implemented in the software and their contours were shown to define the thermal comfort status more precisely. It was concluded that using PV systems to maintain thermal comfort conditions for a working office occupant can be very effective and an attractive solution for designers to consider in situations similar to the study.
ACKNOWLEDGMENT

In the beginning, I would like to thank The Almighty and Great ALLAH for his help, generous giving to me and for his guidance and reconcile throughout this work and my whole life.

I hereby would like to express my deep gratitude and thanks to Prof. Essam E. Khalil, Dr. Esmail M. A. El-Bialy and Dr. Omar A. Huzayyin for their support, continuous encouragement and distinctive supervision throughout the course of this work. They helped providing me with valuable advice and up to date technical references that were of great help in the present work. I am grateful to them, and to all my respectful professors, for mentoring me throughout my undergraduate and graduate study.

I would like to extend my gratitude to Dr. Waleed A. Abdelmaksoud for his valuable suggestions and noteworthy discussions and for supplying me with some of his publications. I would like to thank Eng. Fawzy Abd El Aziz and Eng. Ahmed Hossam Zaki as well for their great help in software technical issues, and Eng. Sherif Ibrahim for providing me with helpful research papers. Thanks are also extended to my friends and colleagues in Mechanical Power Engineering department for their encouragement and support.

Finally, I would like to thank my family for their great and continuous help and support they provided me to finish this work in a suitable form and my fiancée for her love and care.
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