ABSTRACT

AIR MIXED AND DISPLACEMENT VENTILATION SYSTEMS IN OFFICE ROOM WITH THE VARIATION OF SUPPLY AIR DIFFUSER POSITION BASED ON COMPUTATIONAL FLUID DYNAMICS

By: Bambang Iskandriawan

Promotor : Prof. Dr. Ir. Paulus Indiyono, MSc.
Co-promotor : 1. Dr. Ing. Ir. Herman Sasongko
2. Dr. Eng. Ir. Prabowo, M. Eng.

Air ventilation system is a very important part of a house or building. Operated air ventilation system in the room currently is still can be enhanced its performance in the thermal comfort and indoor air quality point of view. On the other hand, the occupant will continually stay inside the room in the long time period relatively. That’s why the successful of operational air ventilation system is expected can more increase comfort, healthy and productivity of room occupant. The doing well of the ventilation system is extremely depend on the issues temperature, velocity, turbulence and air contamination intensity which is occur in the room. Therefore those aspects are researched with the purpose of obtained the effective air ventilation system. The factors mention above are very affected by some constraints such as ventilation capacity, the number and strength of heat sources, room height, contaminant gas capacity and the diffuser location. The air supply diffuser parameter will implemented within the experiment and simulation of ventilation in air mixed ventilation moreover the displacement ventilation system.

The used methodology is with applied CFD (Computational Fluid Dynamics) simulation Fluent 6.2.12. As the research validation is conducted the experiment of direct measurement to the full scale room and real time technique. The result of full scale experiment will be contrasted to the CFD simulation approach. Dimensionless analysis is accomplished in order to explore the quality of air ventilation system based on the arrangement of air supply diffuser.

At the end of the research it will obtained the selected information for effective ventilation system (the best variable) in the purpose of thermal
comfort improving and the sustainability of healthy especially for the room occupant. The thermal comfort of the room is corresponded to the velocity, temperature and turbulence kinetic energy which are appropriate. Additionally it is considered the *surface heat transfer coefficient* and *surface Nusselt number*. They show the quantity of heat energy flow from the heat source to the environment. Whereas the indoor air quality which is play the role in the healthy aspect is affected with the decreasing of air contamination intensity inside the room.