

Arch Riyachan 2011: A Study of Air Flow under raised floor in a Large Data Center. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Associate Professor Chawalit Kittichaikarn, Ph.D. 115 pages.

This research presents a simulation of air flow under raised floor in a large data center. A commercial software in Computational Fluid Dynamics (CFD) was used to visualize and analyze the distribution of air velocity and pressure. Not only the computational simulation was carried out, the measurements of air flow rate through the perforate plate and pressure were also conducted within the data center. The results obtained from these two approaches were then compared. Moreover, a new technique that can be used to distribute the air flow to achieve a similar air flow rate through each perforate plate was developed. Tilted solid partition was installed on the subfloor to increase the pressure under raised floor. From the result obtained, it was found that the computational results and measured data agreed well with each other. Moreover the simulation of air flow under raised floor showed that there was a recirculation of air in some areas. This results in a lower volume flow rate of the air through the perforate plates. It tends to cause hot spot areas and may result in a break down of computer in the data center due to insufficient cooling. Moreover, in a case when the air flow rate through each perforate plate is very much different from each other, the new technique that has been developed in this research can be used to solve this problem.

By tilting the subfloor underneath the raised floor, the air pressure can be increased and the air flow rates through all perforate plates can be uniformly distributed. The standard deviation of air flow rate through the perforate plates can be improved up to 78.9%. The correlation of all important parameters used in the design of under raised floor air conditioning system was then proposed. The designer can use this correlation as a guide line to achieve the more efficient under raised floor air conditioning system.

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Thesis Advisor's signature