Abstract No: 265 *Engineering and Built Environment*

APPLICATION OF THE COUPLED ENERGY SIMULATION AND COMPUTATIONAL FLUID DYNAMICS APPROACH FOR PREDICTING ENERGY PERFORMANCE OF BUILDINGS

R.M.P.S. Bandara[1*] and R.A. Attalage[2]

[1]Department of Mechanical Engineering, General Sir John Kotelawala Defence University, Sri Lanka
[2]Department of Mechanical Engineering, University of Moratuwa, Sri Lanka
[*]priyanthabandara92@yahoo.com

Buildings account for nearly 40% of the global energy consumption and hence presently high emphasize is placed on improving the energy performance of buildings. Energy Simulation (ES) is the most popular approach in predicting the energy performance of buildings during their conceptual design stage. However, it is observed that this methodology shows certain inherent deficiencies in predicting the energy performance of buildings. *Energy Simulation* tools do not have the capacity to model air circulation through the building space explicitly. *ES* tools mainly rely on the simplifying assumption that air within a thermal zone of a building is *well-mixed*. Furthermore, convective heat transfer coefficients of building surfaces are calculated using set empirical correlations. Literature also reveals that most *Energy Simulation* tools under-predict energy consumption in buildings, especially under sunny conditions. On the other hand, Computational Fluid Dynamics (CFD) tools can predict airflow field, velocities, relative humidity and contaminant concentrations within an occupied space of a building extensively and accurately. Also, they are capable of determining the temperature distribution within the building space and convective heat transfer coefficients of the building envelope. However, CFD simulations need to be provided with the corresponding boundary conditions of the computational domain, which are readily available in the Energy Simulation approach. On this basis, the paper explains how *Energy Simulation* can be coupled with Computational Fluid Dynamics in predicting the energy performance of a building more accurately through complementary data exchange between the tools. The office building considered in the study is to be constructed in the suburbs of Colombo. The analysis uses ENERGYPLUS 8.0 and ANSYS FLUENT 6.3 as the tools for conducting Energy Simulation and Computational Fluid Dynamics respectively. MATLAB R2012a establishes the coupling platform. The study shows that the coupled approach predicts considerably higher energy consumption for the building compared to that given by conventional Energy Simulation using ENERGYPLUS.