



Investigations of stack ventilation operations using an energy modeling and BAS system

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Abstract. Green buildings have been intensively constructed due to energy crisis and damaged environment issue. Additionally, a green building focuses on efficient resource utilization and reducing in environment damage. Mechanical designers emphasize solving energy problem issues in large commercial buildings via a stack ventilation application; it can be used to reduce cooling load and mechanical fan power consumptions. However, stack ventilation installation has been problematic due to Thailand climate because heat is absorbed on the lower floor of a building causing higher temperature than upper floors; this issue obstructs buoyancy force. Without consideration the concern, mechanical designers may misunderstand stack ventilation operations from its theory. To avoid the issue, this research applies the three software for assuring the performance composing of: 1) LoopDA for stack ventilation simulation to acquire different temperatures for buoyancy force; 2) SketchUp for developing a simplified building configuration; and 3) TRNSYS used for full energy modelling with and without stack ventilation. The energy modelling is validated via existing building automation system (BAS) data in the example building with the accuracy within $\pm 10\%$. The verified building model can be further used to test the stack ventilation operations via the potential simulation instead of sensor installations.

Keywords: Energy Modelling; Green Building; LoopDA; Stack Ventilation; TRNSYS